

MECHANICK EXERCISES,

O R,

The Doctrine of

Handy-works.

*Began Jan. 1. 1677. And intended to be
Monthly continued.*

By *Joseph Moxon* Hydrographer to the
Kings most Excellent Majesty.



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THE DOCTRINE OF
THE FUTURE LIFE

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PREFACE.

I See no more reason why the sordidness of some Workmen should be the cause of contempt upon Manual Operations than that the excellent invention of a Mill should be despised, because a blind Horse draws in it. And though the Mechanicks be by some accounted ignoble and scandalous. Yet it is very well known, that many Gentlemen in this Nation of good Rank and high Quality are conversant in Handy-Works: And other Nations exceed us in numbers of such. How pleasant and healthy this their Diversion is, their Minds and Bodies find; and how karmless and honest all sober men may judge.

That Geometry, Astronomy, Perspective, Musick, Navigation, Architecture, &c. are excellent Sciences, all that know but their very names will confess: Yet to what purpose would Geometry serve, were it not to teach Handicrafts? Or how could Astronomy be known to any perfection, but by Instruments made by Hand? What Perspective should we have to delight our sight? What Musick to ravish our Ears? What Navigation to guard and enrich our Country? Or what Architecture to defend us from the inconveniences of different Weather, without Manual Operations? Or how waste and useless would many of the Productions of this and other Countries be, were it not for Manufactures?

To dive into the Original of the Mechanicks is impossible, therefore I shall not offer at it; only I shall say, It is Rational to think that the Mechanicks began with

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Man, He being the only Creature that Nature has imposed most necessity upon to use it, endowed with greatest Reason to contrive it, and adapted with properest members (as Instruments) to perform it.

Nor is it easie to find by any Authority what part of the Mechanicks was first practised by Man; Therefore I shall wave that too; and only consider, that if we ourselves were the first Men, what Branch of the Mechanicks we should first NEE D, and consequently have recourse to.

I have considered, and Answer, That without the Invention of Smithing primarily, most other Mechanick Inventions would be at a stand: The Instruments or Tools that are used in them being either made of Iron, or of some other matter form'd by the help of Iron. But pray take notice, that by Iron I also mean Steel, it being originally Iron.

Nor would I have you understand, that when I name the Mechanicks, I mean that rough and barbarous sort of working which is used by the Natives of America, and some other such Places; For, though they did indeed make Houses, Canoes, Earthen Pots, Bowes, Arrows, &c. without the help of Iron, because they had then none among them; Yet since Iron is now known to them, they leave off their old way of working without it, and betake themselves to the use of it. Nor are at this day (though now they have in part the use of Iron) their Machines made by good and ready Rules of Art; for they know neither of Rule, Square, or Compass; and what they do is done by tedious working, and he that has the best Eye at guesing, works best upon the Straight, Square, or Circle.

*You may perhaps think this Preface too long for so small a Pamphlet as this; but let me tell you, It is all
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the Preface I intend for my succeeding Exercises, if it shall please God I continue them, as I hope to do: For, having for many years been conversant in Handy-Works, and especially in those Trades wherein the chief knowledge of all Handy-Works lie, viz. Smithing, Founding, Drawing, Joynery, Turning, Engraving, Printing Books and Pictures, Globe and Map-making, Mathematical Instruments, &c. So I am willing to communicate to the Publique the knowledge I have attained to. But because the whole will be both a Work of Time and great Charge, I mean to try by the sale of some few Monthly Exercises what encouragement I may have to run through all, if I live so long, and accordingly to continue or desist.

I thought to have given these Exercises the Title of The Doctrine of Handy-crafts; But when I considered the true meaning of the word Handy-crafts, I found the Doctrine would not bear it, because Handy-craft signifies Cunning or Sleight, or Craft of the Hand, which cannot be taught by Words, but is only gain'd by Practice and Exercise: therefore I shall not undertake that with the bare reading of these Exercises any shall be able to perform these Handy-works; but I may safely tell you that these are the Rules that every one that will endeavour to perform them must follow, and that by the true observing them, he may, according to his stock of Ingenuity and Zeal in diligence, sooner or later inure his hand to the Cunning or Craft of working like a Handy-craft, and consequently be able to perform them in Time.

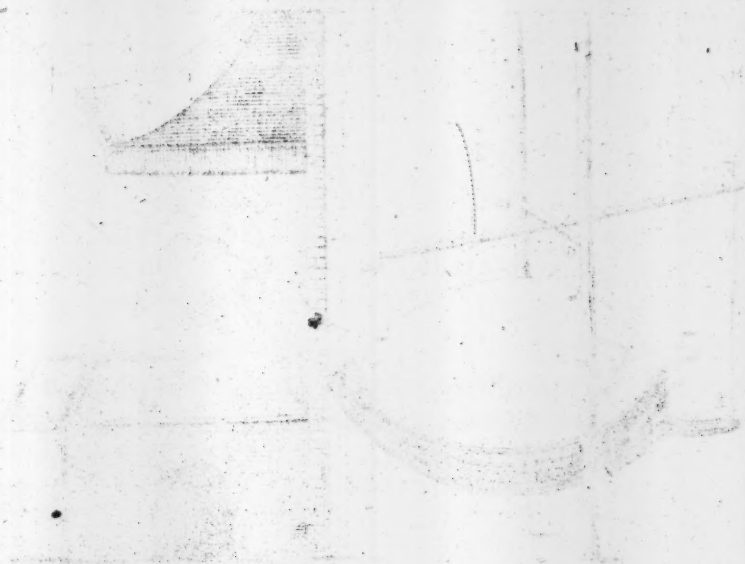
For the Reason aforesaid I intend to begin with Smithing, which comprehends not only the Black-Smiths Trade, but takes in all Trades which use either Forge or File, from the Anchor-Smith to the Watch-Maker; they all working by the same Rules, though not with equal exactness,

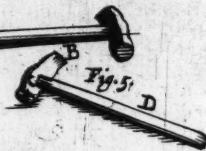
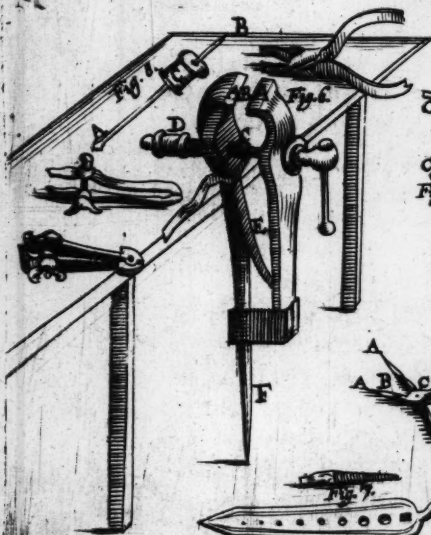
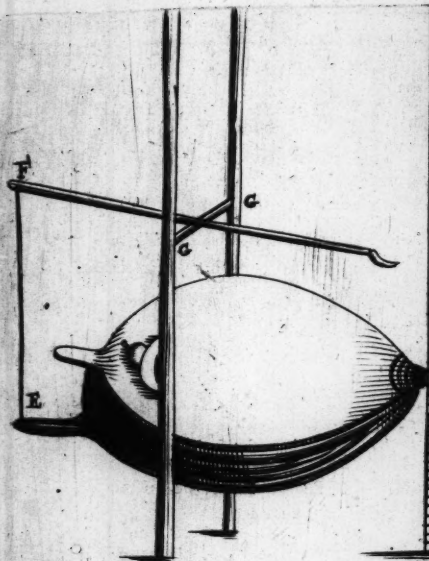
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ness, and all using the same Tools, though of several sizes from those the common Black-Smith uses, and that according to the various purposes they are applyed to: And in order to it I shall first shew you how to set up a Forge, and what Tools you must use in the Black-Smiths work; then the Rules and several Circumstances of Forging till your Work come to the File: Then of the several sorts of Iron that are commonly used, and what sort is fittest for each purpose. Afterwards of Filing in general, and the Rules to be observed in it in the making of Jacks, Hindges, Screws, Clocks, Watches, &c. In which Examples you will find all other sorts of Forging or Filing work whatsoever comprehended. And lastly, as a close to Smithing I shall exercise upon Steel, and its several sorts, and how to order and temper it for its several uses, and what sort is fittest for each particular purpose, as which is fittest for Edge-Tools, which for Springs, which for Punches, &c.

Some perhaps would have thought it more Policy to have introduced these Exercises with a more curious and less Vulgar Art than that of Smithing; but I am not of their opinion; for Smithing is (in all its parts) as curious a Handy-craft as any is: Besides, it is a great Introduction to most other Handy-works, as Joynery, Turning, Founding, Printing, &c. they all (with the Smith) working upon the Straight, Square, or Circle, though with different Tools upon different Matter; and they all having dependence upon the Smiths Trade, and not the Smith upon them. But having done with Smithing, I shall, God willing, proceed to those and all other Handy-works whatsoever that work upon Geometrical Principles.

Joseph Moxon.





MECHANICK EXERCISES,

O R, The Doctrine of *Handy-Works*.

Of Smithing in general.

Definition.

Smithing is an Art Manual, by which an irregular lump (or several lumps) of Iron is wrought into an intended shape.

This Definition needs no explanation: Therefore I shall proceed to give you an account of the Tools a Smith uses; not but (that they being so common) I suppose you do already know them; but partly because they may require some pre-caution in setting them up fittest to your use, and partly because it behoves you to know the names Smiths call the several parts of them by, that when I name them in Smiths Language, as I shall oft have occasion to do in these *Exercises*) you may the easier understand them as you read them.

Of setting up a Smiths Forge.

THe *Hearth*, or Fire-place of the *Forge* marked A, is to be built up from your floor with Brick, about two foot and an half, or sometimes two foot nine inches high, according to the purpose you design your *Forge* for: for if your *Forge* be intended for heavy work, your *Hearth* must lie lower than it

B

need

need be for light work, for easiness of management, and so broad as you think convenient: It may be built with hollow Arches underneath to set several things out of the way. The Back of the *Forge* is built upright to the top of the Ceiling, and inclosed over the Fire place with a *Hovel*, which ends in a *Chimney* to carry away the smoak, as B. In the back of the *Forge* against the Fire place is fixed a thick Iron plate, and a taper Pipe in it about five inches long, called a *Tewel*, (or as some call it a) *Tewl-Iron*, which Pipe comes through the back of the *Forge*, as at C. Into this taper *Pipe* or *Tewel* is placed the Nose or *Pipe* of the *Bellows*. The office of this *Tewel* is only to preserve the Pipe of the *Bellows*, and the back of the *Forge* about the Fire place from burning. Right against the Back is placed at about twenty inches or two foot distance the *Trough*, and reaches commonly through the whole breadth of the *Forge*, and is as broad and deep as you think good, as at D. The *Bellows* is placed behind the Back of the *Forge*, and hath as aforesaid its *Pipe* fitted into the pipe of the *Tewel*, and its lower Board fixed so that it move not upwards or downwards. At the ear of the upper *Bellows-board* is fastned a *Rope*, or sometimes a *Thong* of leather, or an Iron *Chain* or *Rod*, as E, which reaches up to the *Rocker*, and fastned there to the farther end of the *Handle*, as at F. This handle is fastned across a *Rock-staff* which moves between two Cheeks upon two Center-pins in two Sockets, as at G. So that by drawing down this *Handle* the upper board of the *Bellows* rises, and by a considerable weight set upon it sinks down again, and by this agitation performs the office of a pair of *Bellows*.

Of

Of the Anvil.

THe shape of a Black Smiths *Anvil* I have inserted in this Figure, though it is sometimes made with a *Pike*, or *Bickern*, or *Beak-iron* at one end of it, whose use I shall shew you when I come to round hollow work. Its *Face* must be very flat, and smooth, without flaws, and so hard that a File will not touch it, (as Smiths say when a File will not cut or race it.) The upper Plain A is called the *Face*; it is commonly set upon a wooden *Block*, that it may stand very steddy and solid, and about two foot high from the floor, or some times higher, according to the stature of the person that is to work at it.

Of the Tongs.

THere are two sorts of *Tongs* used by Smiths; the one the *Straight nosed Tongs*, used when your work is short and somewhat flat, and generally for all Plate Iron. The other the *Crooked nos'd Tongs*, to be used for the forging small Bars, or such thicker work as will be held between their *Chaps*. The *Chaps* are placed near the Joynt, because, that considering the length of the *Handles*, they hold the Iron faster than they would do were they placed farther from the Joynt, as in the Fig. 3, 4. A the *Chaps*, B the Joynt, C C the *Handles*.

Of the Hammer and the Sledge.

THere are several sorts of *Hammers* used by Black-Smiths; as first the *Hand-Hammer*, which is sometimes bigger or less according to the strength of the Workman, but it is a *Hammer* of such weight

that it may be weilded or govern'd with one hand at the *Anvil*. Secondly, the *Uphand Sledge*, used by under-Workmen when your work is not of the largest, yet you require help to batter or *draw it out*; they use it with both their hands before them, and seldom lift their *Hammer* higher than their Head. Thirdly, the *About Sledge*, is the biggest *Hammer* of all, and is also used by under-Workmen for the battering or *drawing out* of the largest work; and then they hold the further end of the *Handle* in both their hands and swinging the *Sledge* above their Heads, they at arms end let fall as heavy a blow as they can upon the work. There is also another *Hammer* used by them, which they call a *Riveting Hammer*: this is the smallest *Hammer* of all, and very rarely used at the *Forge*, unless your work prove very small: but upon cold Iron it is used for Riveting, or setting straight, or crooking small work. In Fig. 5. A the *Face*, B the *Pen*, C the *Eye*, D the *Handle*.

Of the Vice.

THE *Vice* must be set up very firmly that it shake not, and stand upright with its *Chaps* parallel or range with your *Work-bench*; because square filing is a great piece of good Workmanship in a Smith, and should your Vice not stand upright and range with the *Work-bench*, the *Chaps* pinching upon two square sides would make the top side of your work either lean towards you or from you, and consequently you filing (as a good Workman ought to do) upon the Flat or Horizontal plain of your work, would take off more of that angle or edge which rises higher than the Plain, and less off

off that edge that lies lower than the Plain; so that an Angle being higher or lower than the other, your work instead of *Square* would be *Squire-wise*, when you shall have filed all its flat sides, and that more or less according to the leaning of the *Chaps* of your *Vice*. A A the *Face*, hath its two ends lie in a straight line with the middle of its *Face* or *Plain*, B the *Chaps* must be cut with a *Bastard Cut*, and very well temper'd. C the *Screw-Pin* cut with a square strong *Worm* or thred. D the *Nut* or *Screw-Box* hath also a *Square Worm*, and is brazed into the round *Box*. E the *Spring* must be made of good Steel, and very well temper'd; where note, that the wider the two ends of the *Spring* stand asunder, the wider it throws the *Chaps* of the *Vice* open. F the *Foot*, must be straight and strong enough to bear good heavy blows upon the work screwed in the *Chaps* of the *Vice*, that it neither bow or tremble.

Of the Hand-Vice.

OF the *Hand-Vice* are two sorts, one is called the *Broad Chap't Hand-Vice*, the other the *Square Nos'd Hand-Vice*. The Office of the *Hand-Vice*, is to hold small work in that may require often turning about; it is held in the left hand, and each part of your work turned upwards successively that you shall have occasion to file with your right. The *Square Nos'd Hand-Vice* is seldom used but for filing small Globulous work, as the Heads of Pins that round off towards the edges, &c. And that because the *Chaps* do not stand shouldering in the way, but that the flat of the *File* may the better come at the edges. Their *Chaps* must be cut as the *Vice* aforesaid, and well tempered.

Of

Of the Plyers.

Plyers are of two sorts, *Flat Nos'd* and *Round Nos'd*. Their office is to hold and fasten upon all small work, and to fit it in its place. The *Round Nos'd Plyers* are used for turning or bowing Wyer or small Plate into a circular form. The *Chaps* of the *Flat Nos'd Plyers* must also be cut and temper'd as the *Chaps* of the *Vice*. A the *Nose*, B the *Chaps*, C the *Joint*, D D the *Handles*.

Of the Drill and Drill-Bow

Drills are used for the making such holes as *Punches* will not conveniently serve for, as a piece of work that hath already its shape, and must have an hole or more made in it : Here the force of a *Punch* will set your work out of order and shape, because it will both batter the surface of the Iron, and stretch its sides out : the shank of a *Key* also, or some such long hole, the *Punch* cannot strike, because the shank is not forged with substance sufficient : but the *Drill*, though your work be filed and polisht, neither batters or stretches it, but cuts a true round hole just in the point you first place it. You must have several sizes of *Drills*, according as your work may require. The shape in Fig. 6. is enough to shew the fashion of it, but it must be made of good Steel, and well temper'd. A the *Point*, A B the *Shank*, C the *Drill-barrel*; where Note, that the bigger your *Drill-barrel* is, the easier it runs about, but less swift.

And as you must be provided with several *Drills*, so you may sometimes require more than one *Drill-bow*, or at least several *Drill-strings*; the strongest strings

strings for the largest *Drills*, and the smallest strings for the smallest *Drills*: But you must remember, that whether you use a small or strong string, you keep your *Drill-bow* straining your string pretty stiff, or else your string will not carry your *Barrel* briskly about. But your string and Bow must both be accommodated to the size of your *Drill*; and if both or either be too strong, they will break or bend your *Drill*; or if too weak, they will not carry about the *Barrel* as aforesaid.

The *Drill-plate* or *Breast-plate* is only a piece of flat Iron fixt upon a flat Board, which Iron hath an hole punched a little way into it to set the blunt end of the shank of the *Drill* in when you drill a hole; Workmen instead of it commonly use the *Hammer*, into which they prick a hole a little way on the side of it, and so set the *Hammer* against their Breast.

Of the Screw-plate and its Taps.

THe *Screw-plate* is a plate of Steel well temper'd, with several *holes* in it, each less than other, and in those *holes* are *threads* groved inwards, into which *Groves* fit the respective *Taps* that belong to them. The *Taps* that belong to them are commonly made tapering towards the point, as Fig. 7. shews. But these tapering *Taps* will not serve for some sorts of work, as I shall shew in its proper place.

These are the most essential Tools used in the Black-Smiths Trade; but some accidental work may require some accidental Tools, which, as they may fall in, I shall give you an account of in convenient place.

Of

Of Forging in general.

I Think it needless to tell you how to make your Fire or blow it, because they are both but Labourers work, nor how little or big it need to be, for your own reason will by the size of your work teach you that ; only let me tell you the Phrase Smiths use for [Make the Fire] is *Blow up the Fire*, or sometimes, *Blow up the Coals*.

When it is burning with the Iron in it, you must with the *Slice* clap the Coals upon the outside close together to keep the heat in the body of the Fire, and as oft as you find the Fire begin to break out, clap them close again, and with the *Washer* dipt in water wet the outside of the Fire to damp the outside, as well to save Coals, as to strike the force of the Fire into the inside, that your work may *heat* the sooner. But you ought oft to draw your work a little way out of the Fire, to see how it *takes its Heat*, and quickly thrust it in again, if it be not hot enough ; for each purpose your work is designed to, ought to have a proper *Heat* suitable to that purpose, as I shall shew you in the several *Heats* of Iron ; for if it be too cold, it will not *feel the weight of the Hammer* (as Smiths say when it will not batter under the *Hammer*) and if it be too hot it will *Red-scar*, that is, break or crack under the Hammer while it is working between Hot and Cold.

Of the several Heats Smiths take of their Iron.

There are several degrees of *Heats* Smiths take of their Iron, each according to the purpose of their work : as first, a *Blood-red Heat*. Secondly, a *White Flame Heat*. Thirdly, a *Sparkling* or *Welding Heat*.
The

The *Blood-red Heat* is used when your Iron hath already its form and size, as sometimes square Bars and Iron Plates, &c. have, but may want a little hammering to smooth it. Use then the Face of your *Hand-hammer*, and with light flat blows hammer down the irregular risings into the Body of your Iron, till it be smooth enough for the File. And Note, That it behoves a good Workman to hammer his work as true as he can; for one quarter of an hour spent at the *Forge* may save him an hours work at the *Vice*.

The *Flame* or *White Heat* is used when your Iron hath not its Form or Size, but must be forged into both; and then you must take a piece of Iron thick enough, and with the *Pen* of your *Hammer*, (or sometimes according to the size of your work, use two or three pair of Hands with *Sledges* to) batter it out, or as Workmen call it, to *Tew* or *draw it out*, till it comes to its breadth, and pretty neer its shape: And so by several *Heats*, if your work require them, frame it into Form and Size; then with the Face of your *Hammer*, smooth your work from the dents the *Pen* made, as you did with a *Blood-red Heat*.

A *Sparkling* or *Welding Heat* is only used when you *double-up* your Iron (as Smiths call it) to make it thick enough for your purpose, and so *weld* or work in the *doubling* into one another, and make it become one entire lump; or it is used when you joyn several Bars of Iron together to make them thick enough for your purpose, and work them into one Bar; or else it is used when you are to joyn or *weld* two pieces of Iron together end to end to make them long enough: but in this case you must be very quick at the *Forge*, for when your two

ends are throughout of a good *Heat*, and that the inside of the Iron be almost ready to run as well as the outside, you must very hastily snatch them both out of the Fire together, and (after you have with the edge of your *Hammer* scraped off such Scales or dirt as may hinder their incorporating) with your utmost diligence clap your right hand piece upon your left hand piece, and with all speed (least you lose some part of your good *Heat*) fall to hammering them together, and work them soundly into one another: and this if your Bars be large will require another or sometimes two or three pair of hands besides your own to do; but if it be not thoroughly *welded* at the first *Heat*, you must reiterate your *Heats* so oft till they be thoroughly *welded*; then with a *Flame Heat* (as before) shape it, and afterwards smooth it with a *Blood red Heat*. To make your Iron come the sooner to a *Welding Heat*, you must now and then with your *Hearth-staf* stir up the Fire and throw out those Cinders the Iron may have run upon, for they will never burn well, but spoil the rest of the Coals, and take a little white Sand between your Finger and your Thumb and throw upon the heating Iron, then with your Slice quickly clap the outside of your Fire down again, and with your *Washer* dipt in Water damp the outside of the Fire to keep the Heat in.

But you must take special care that your Iron *burn* not in the Fire, that is, that it do not *run* or melt, for then your Iron will be so brittle that it will not endure Forging without breaking, and so hard, that a *File* will not touch it.

Some Smiths use to strew a little white Sand upon the Face of the *Anvil* also, when they are to hammer upon a *welding Heat*; for they say it makes the Iron *weld* or incorporate the better.

If

If through mistake or ill management your Iron be too thin, or too narrow towards one of the ends; then if you have substance enough (and yet not too long), you may *Up-set* it, that is, take a *Flame Heat*, and let the heated end upright upon the *Anvil*, and hammer upon the cold end till the Heated end be beat or *up-set* into the Body of your Work. But if it be a long piece of work, and you fear its length may wrong the middle, you must hold it in your left hand, and lay it flat on the *Anvil*; but so as the heated end intended to be *up-set* may lie a little over the further side of the *Anvil*, and then with your *Hand-Hammer* in your right hand beat upon the heated end of your work, minding that every stroak you take you hold your work stiff against the *Face* of the *Hammer*. Afterwards smooth it again with a *Blood-red heat*.

If you are to Forge a *Sholder* on one or each side of your work, lay the shank of your Iron at the place where your *Sholder* must be on the edge of your *Anvil* (that edge which is most convenient to your hand) and if more *Sholders* be to be made, turn them all successively, and Hammer your Iron so, as that the shank of the Iron that lies on the flat of the *Anvil* feel as well the weight of your blows as the *Sholder* at the edge of the *Anvil*: for should you lay your blows on the edge of the *Anvil* only, it would instead of flattening the shank to make the *Sholder*, cut your work through.

Your work will sometimes require to have holes punched in it at the Forge, you must then make a *Steel Punch* to the size of the hole you are to strike, and harden the point of it without tempering, because the heat of the Iron will soften it fast enough, and sometimes too fast; but then you must re-harden it: then taking a *Blood-heat* of your Iron, or if it be very large almost a *Flame Heat*;

lay it upon your *Anvil*, and with your left hand place the point of the *Punch* where the hole must be, and with the *Hand-hammer* in your right hand punch the hole: or if your work be heavy, you may hold it in your left hand, and with your *Punch* fixed at the end of a *Hoop-stick* or some such Wood, hold the stick in your right hand, and place the point of your *Punch* on the work where the hole must be, and let another man strike till your *Punch* come pretty near the bottom of your work; which when it does, the sides of your work round about the hole will rise from the *Face* of the *Anvil* and your *Punch* will print a bunching mark upon the hole of a *Bolster*, that is a thick Iron with a hole in it, and placing your *Punch* as before strike it through. But you must note, that as oft as you see your *Punch* heat or change colour, you take it out of the hole and pop it into water to reharden it, or else it will batter in the hole you intend to strike, and not only spoil it self, but the work too, by running aside in the work. Having punched it through on the one side, turn the other side of your work, and with your Hammer set it flat and straight, and with a *Blood Heat* punch it through on the other side also: So shall that hole be fit for the *File*, if the curiosity of your purposed work cannot allow it to pass without filing. When your work is Forged do not quench it in water to cool it; but throw it down upon the *Floor* or *Hearth* to cool of it self, for the quenching it in water will harden it: as I shall shortly shew you when I come to the tempering of Steel.

Of Brazing and Soldering.

YOU may have occasion sometimes to *Braze* or *Solder* a piece of work; but this is used by Smiths only when their work is so thin or small that it will not endure

endure *Welding*. To do this take small pieces of Brasse and lay them on the place that must be Brazed, and Strew a little Glass beaten to powder on it to make it run the sooner, and give it a *Heat* in the *Forge*, till (by sometimes drawing it a little way out of the Fire) you see the Brasse run. But if your work be so small or thin that you may fear the Iron will run as soon as the brasse, and so you loose your work in the Fire, then you must make a *Loam* of three parts Clay and one part Horse-dung, and after they are wrought and mingled very well together in your hands wrap your work with the Brasse and a little beaten Glass upon the place to be brazed close in the *Loam*, and laying it a while upon the *Hearth* of the *Forge* to dry, put the Lump into the Fire and blow the *Bellows* to it, till you perceive it have a full *Heat*, that is, till the Lump look like a well burnt Coal of Fire: Then take it out of the Fire, and let it Cool. Afterwards break it up and take out your work.

Thus much of Forging in general. It remains now that you know what Sorts of Iron are fittest for the several uses you may have occasion to apply them to.

Of several sorts of Iron, and their proper uses.

IT is not my purpose in this place to tell you how Iron is made, I shall defer that till I come to treat of Mettals and their Refinings. Let it at present satisfy those that know it not, that Iron is by a violent Fire melted out of hard stones called *Iron-stones* of these *Iron-stones* many Countries have great plenty. But because it wastes such great quantities of Wood to draw the Iron from them it will not in many places quit cost to use them. In most parts of *England* we have abundance of these *Iron-stones*. But our English Iron is generally a course sort of Iron, hard and brittle, fit for Fire-bars and other such course uses: Unless it be about the *Forrest of Dean*, and some few places more, where the Iron proves very good.

Swedish Iron is of all sorts the best we use in *England*: It is a fine tough sort of Iron, will best endure the Hammer, and is Softest to file; and therefore most coveted by Work-men to work upon.

Spanish Iron would be as good as *Swedish* Iron were it not subject to *Red-scar*, (as Work-men phrase it) that is to crack betwixt hot and cold. Therefore when it falls under your hands you must tend it more earnestly at the Forge. But though it be a good tough soft Iron, yet for many uses Work-men will refuse it, because it is so ill,

and un-evenly wrought in the Bars that it costs them a great deal of labour to smooth it; But it is good for all great works that require *Welding*, as the Bodies of Anvils, Sledges, large Bell-clappers, large Pestles for Mortars, and all thick strong Bars, &c. But it is particularly chosen by *Anchor Smiths*, because it abides the Heat better than other Iron, and when it is well wrought is toughest.

There is some Iron comes from *Holland* (though in no great quantity) but is made in *Germany*. This Iron is called *Dort Squares*, only because it comes to us from thence, and is wrought into square Bars three quarters of an inch square. It is a bad course Iron and only fit for sleight uses, as Window-Bars, Brewers-Bars, Fire-Bars, &c.

There is another sort of Iron used for making of *Wyer*, which of all other sorts is the softest and toughest: But this sort is not peculiar to any Countrey, but is indifferently made where any Iron is made, though of the worst sort, for it is the first Iron that runs from the *Stone* when it is melting, and is only preserved for the making of *Wyer*. By what hath been said, you may see that the softest and toughest Iron is the best: Therefore when you choose Iron, choose such as bows softest before it break, which is an argument of Toughness; And see it break sound within, be gray of colour like broken Lead, and free from such glistering specks you see in broken *Antimony*, having no flaws or divisions in it, for these are arguments that it is sound and well wrought at the Mill.

Of Filing in general.

THe several sorts of Files that are in common use are the *Square*, the *Flat*, the *Three Square*, the *Half Round*, the *Round*, the *Thin File*, &c. All these shapes you must have of several sizes and of several *Cuts*. You must have them of several sizes, as well because you may have several sizes of work, as for that it sometimes falls out that one piece of work may have many parts in it joyned and fitted to one another, some of them great, and others small: And you must have them of several *Cuts*, because the *Rough Tooth'd File* cuts faster than the *Bastard Tooth'd File*, the *Bastard Tooth'd File* faster than the *Fine Tooth'd File*, the *Fine Tooth'd File* faster than the *Smooth Tooth'd File*.

The *Rough* or *Course Tooth'd File* (which if it be large is called a *Rubber*) is to take out the unevenness in your work which the
Hammer

Hammer made in the Forging : the *Bastard Tooth'd File* is to take out of your work the deep cuts or file stroaks the *Rough File* made : the *Fine Tooth'd file* is to take out the cuts or file stroaks the *Bastard file* made : and the *Smooth file* is to take out those cuts or file-stroaks that the *fine file* made.

Thus you see how the *files* of several *cuts* succeed one another till your work is so smooth as it can be filed. You may make it yet smoother with *Emerick, Tripoli, &c.* But of that in its proper place, because it suits not with this Section of *Filing*.

You must take care when you use the *Rough file*, that you go very lightly over those dents the *Hammer* made in your work, unless your work be Forged somewhat of the strongest, for the dents being irregularities in your work, if you should file away as much in them as you do off the eminencies or risings, your work, whether it be straight or circular, would be as irregular as it was before you filed it : And when you file upon the prominent or rising parts of your work with your *course cut File*, you must also take care that you file them not more away than you need, for you may easily be deceived, because the *course File* cuts deep, and makes deep scratches in the work ; and before you can take out those deep scratches with your finer cut *Files*, those places where the *Risings* were when your work was forged may become dents to your *Hammer* dents : Therefore file not those *Risings* quite so low as the dents the *Hammer* made, but only so low as that the scratches the *Rough file* makes may lie as low or deep in your work as the *Hammer* dents do ; for then, when you come with your smoother Cut *Files* after your *rough File* the scratches of your *rough File*, and your *Hammer* stroaks or dents may both come out together. But to do this with greater certainty, hold your *File* so that you may keep so much of the length of your *File* as you can to rub range or (as near range as you can) upon the length of your work ; for so shall the *File* enter upon the second *Rising* on your work before it go off the first, and will slip over and not touch the dent or hollow between the two *Risings*, till your *Risings* are brought into a straight line with your hollow dent. But of this more shall be said when I come to the Practice of *Filing* upon several particular sorts of work.

If it be a Square Bar or such like you are to file upon, all its angles or edges must be left very sharp and straight. Therefore your *Vice* being well set up, according to foregoing Directions, you must in your
filing

filing a thwart over the *Chaps* of the *Vice* be sure to carry both your hands you hold the *file* in truly Horizontal or flat over the work, for should you let either of your hands mount, the other would dip, and the edge of that Square it dips upon would be taken off: And should you let your hand move never so little circularly both the edges you file upon would be taken off, and the Middle of your intended flat would be left with a Rising on it. But this Hand-craft you must attain to by Practice, For it is the greatest Curiosity in filing.

If it be a round Piece or Rod of Iron you are to file upon, what you were forbid upon square Work you must perform on the Round, for, you must dip your Handle-hand, and mount your end hand a little, and laying pretty near the end of your File to the work, file circularly upon the work, by mounting your Handle-hand by degrees, and dipping your end-hand, in such manner, as when the Middle of your File comes about the top of your Work, your File may be flat upon it, and as you continue your stroak forwards still keep your hands moving circularly till you have finished your full stroak, that is, a stroak the whole length of the File. By this manner of circular filing, you keep your Piece or Rod round: But should you file flat upon the top of your work, so many times as you shall remove or turn your work in the *Vice*, So many flats or squares you would have in your work; which is contrary to your purpose.

When you thrust your file forwards lean heavy upon it, Because the *Teeth* of the *File* are made to cut forwards: But when you draw your file back to recover an other thrust, lift or bear the File lightly just above the work; for it cuts not coming back.

Thus much of filing in general. In my next Moneths Exercise I shall reduce these Notions to particular Practice; and shew the making of Hindges, Locks, Jacks, Screws, &c. Which skill if you can by Practice attain to, you may reckon your self able to make all sorts of Smiths work whatsoever.

F I N I S.

MECHANICK EXERCISES,

OR,

The Doctrine of

Handy-works.

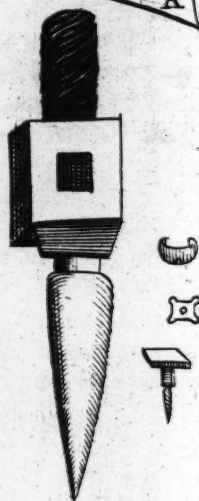
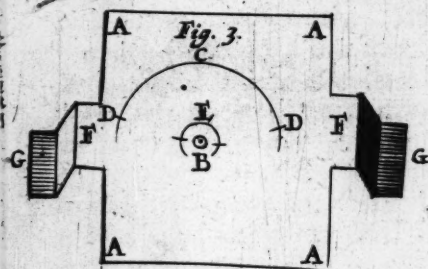
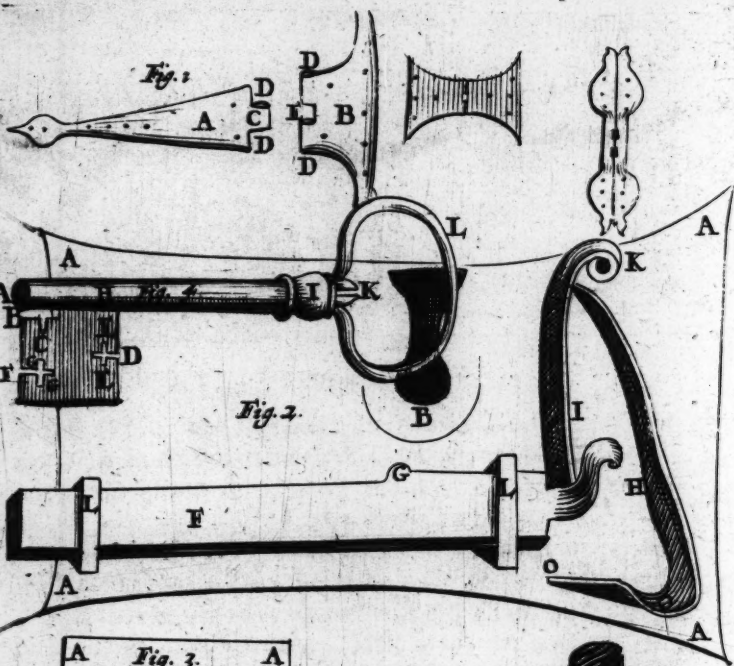
*From Jan. 1. 1677. to Feb. 1. 1677. And is
intended to be Monthly continued.*

By *Joseph Moxon* Hydrographer to the
King's most Excellent Majesty.



L O N D O N,

Printed for *Joseph Moxon* at the Sign of *Atlas* on
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MECHANICK EXERCISES, 35

O R,

The Doctrine of *Handy-Works*.viz. *Hinges, Locks, Keys, Screws and Nuts small and great.**Of Hinges.*

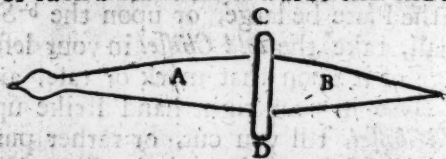
IN Fig. 1. A the *Tail*, B the *Cross*, C D D D D E the *Joynt*, D D D D the *Pin-hole*: when the *Joynt* at C on the *Tail* is pin'd into the *Joynt* at E in the *Cross*, the whole Hinge is called a *Cross Garnet*.

Hinges, if they be small (as for Cup-board doors, Boxes, &c.) are cut out of cold Plate Iron with the *Cold Chissel*, but you must mark the out-lines of your intended *Hinge*, as fig. 1. the *Cross Garnet*, either with Chalk, or else rase upon the Plate with the corner of the *Cold Chissel*, or any other hardned Steel that will scratch a bright stroke upon the Plate: And then laying the Plate flat upon the *Anvil* if the Plate be large, or upon the *Stake* if the Plate be small, take the *cold Chissel* in your left hand, and set the edge of it upon that mark or rase, and with the *Hand Hammer* in your right hand strike upon the head of the *cold Chissel*, till you cut, or rather punch the edge of the *cold Chissel* almost through the Plate in that place: I say almost through, because should you strike it quite through, the edge of the *cold Chissel* would be in danger of battering, or else breaking; for the *Face* of the *Anvil* is hardned Steel, and a light blow against its *Face* would wrong the edge of the *cold Chissel*: besides, it sometimes happens that the *Anvil* or *Stake* is not all over so hard as it should be, and then

the *cold Chissel* would cut the *Face* of the *Anvil* or *Stake*, and consequently spoil it: Therefore when the edge of the *cold Chissel* comes pretty near the bottom of the *Plate*, you must lay but light blows upon the *cold Chissel*: and yet you must strike the edge of the *cold Chissel* so near through the bottom of the *Plate*, that you may break the remaining substance asunder with your fingers, or with a pair of *Plyers*, or sometimes by pinching the *Plate* in the *Vice* with the *Cut* place close to the *Superficies* of the *Chaps* of the *Vice*; and then with your *Fingers* and *Thumb* or your whole hand wriggle it quite asunder. But having cut one breadth of the *cold Chissel* remove the edge of it forward in the race and cut another breadth, and so move it successively till your whole intended shape be cut out of the *Plate*.

When you cut out an *Hinge* you must leave on the length of the *Plate* *A B* in this Figure, *Plate* enough to lap over for the *Joynt*; I mean to *turn* or *double* about a round *Pin*, so big as you intend the *Pin* of your *Hinge* shall be, and also *Plate* enough to *weld* up on the inside of the *Hinge* below the *Pin-hole* of the *Joynt*, that the *Joynt* may be strong.

The size or diameter of the *Pin-hole* ought to be about twice the thickness of the *Plate* you make the *Hinge* of; therefore lay a *wyre* of such a diameter towards the end *B*, on the *Tail-piece* a thwart the *Plate* as *C D*, and double the end of the *Plate*



B, over the *wyre* to lap over it and reach as far as it can upon the end *A*: then hammer the *Plate* that is lap'd over the *wyre* close to the *wyre*, to make the *Pin-hole* round: but if your *Plate* be thick it will require the taking of an *Heat* to make it *Hammer* the closer to the *wyre*, and consequently make the *Pin-hole* the rounder: your work may also sometimes require to be screwed into the *Vice* with the doubled.

doubled end upwards, and the bottom side of the wyre close against the *Chaps* of the *Vise*, and then to *Hammer* upon the very top of the *Pin-hole*, to round it at the end also: when you have made the *Pin-hole* round in the inside, take the *Pin C D* out of the *Pin-hole*, and put the *Joynt end* of the *Hinge* into the fire to take a *welding heat*; which when it hath, snatch it quickly out of the fire and *Hammer* or *weld* the end *B* upon the *Tail piece A* till they be incorporate together. But you must have a care that you *Hammer* not upon the plate of the *Pin-hole*, lest you stop it up or batter it: when it is well welded you must again put in the *Pin C D*, and if it will not well go into the *Pin-hole* (because you may perhaps have *Hammer'd* either upon it, or too near it, and so have somewhat closed it) you must force it in with your *Hammer*, and if it require take a *Blond heat* or a *Flame heat* of the *Joynt end*, and then force the *Pin* into the *Pin-hole* till you find the *Pin-hole* is again round within, and that the *Pin* or wyre turn evenly about within it.

Afterwards with a *Punch* of hardned Steel (as you were taught *Numb. I. fol. 11, 12.*) *punch* the *Nail holes* in the Plate: or if your plate be very thia, you may *punch* them with a *cold Punch*. After all, *smooth* it as well as you can with your *Hand hammer*: Take a *Blood-red heat* if your work require it; if not, *smooth* it cold; so shall the *Tail piece* be fit for the *File*. Double and *weld* the *Cross piece* as you did the *Tail piece*.

Having *Forg'd* your *Hinge* fit for the *File*, you must proceed to make the *Joynt*, by cutting a notch in the middle of the *Pin-hole* between *D D* on the *Cross* as at *E*, and you must cut down the ends of the *Pin-hole* on the *Tail piece* as at *D D* till the *Joynt* at *C* fit exactly into the notch in the *Cross*, and that when the *Pin* is put into the *Pin-hole D D* on the *Cross*, the *Pin-hole* in the *Tail piece* may also receive the *Pin*: then by holding the *Tail piece* in one hand and the *Cross* in the other, double the *Tail* and *Cross* towards one

another to try if they move evenly and smoothly without shaking on the *Pin*, which if they do, the *Joynt* is made, if they do not, you must examine where the fault is, and taking the *Pin* out, mend the fault in the *Joynt*.

Then *File* down all the irregularities the *cold Chissel* made on the edges of your work, and (if the curiosity of your work require it) *File* also the outer flat of your work. But *Smiths* that make quantities of *Hinges* do *brighten* them (as they call it) yet they seldom *File* them, but *grinde* them on a grinde-stone till they become *bright*, &c.

Having finished the *Joynt* put the *Pin* in again : but take care it be a little longer than the depth of the *Joynt*, because you must batter the ends of the *Pin* over the inner edges of the *Pin-hole*, that the *Pin* may not drop out when either end of the *Gross* is turned upwards.

The chiefeft curiosity in the making these and (indeed all other *Hinges* is (1) That the *Pin-hole* be exactly round and not too wide for the *Pin*. (2) That the *Joynts* are let exactly into one another, that they have no play between them, lest they shake upwards or downwards, nor yet are forced too hard into one another, lest when they are nailed on the door the *Joynt* be in danger of breaking. (3.) That the *Gross* and the *Tail* lye on the under side exactly flat, for should they warp out of flat when they are nailed on, the nails would draw the *Joynt* awry, and not only make it move hard and unevenly, but by oft opening and shutting break the *Joynt*. (4.) If your work be intended to be curious, the true *square filing* the upper side as you were taught *Numb. I. fol. 14, 15, 16.* is a great ornament.

a *Smiths* call all Chissels they use upon cold Iron, *Cold Chissels*.

b. The *Skale* is a small *Anvil* which either stands upon a broad Iron foot or *Basis* on the *work-bench*, to remove as occasion offers; or else it hath a strong Iron *spike* at the bottom, which Iron *spike* is let into some certain place

place of the *work-bench* not to be removed. Its office is to set small cold work straight upon, or to cut or punch upon with the *cold Chissel* or *cold Punch*.

Smiths call all *Punches* they use upon cold Iron *cold Punches*.

If the *Hinge* you are to make be large, and plate Iron is not strong enough for it, you must *Forge* it out of flat bar iron, as you were taught *Numb. I. fol. 8. to 13.*

The manner of working *duff-tails*, and *side-hinges*, &c. is (the shape considered) in all respects the same I have hereshewed you in *Cross-Garnets*. But in these or others you may if your work require curiosity, instead of *doubling* for the *Joints*, *Forge* the *Round* for the *Joint* of full Iron, and afterwards *drill* a hole through it for the *Pin-hole*; and by curious *filig* work them so true into one another, that both sides of the *Hinges* shall seem but one piece: as I shall shew more at large, when I come to the making *Compasses*, and other *Joints* for *Mathematical Instruments*.

Of Locks and Keys.

AS there are *Locks* for several purposes, as *Street-door Locks*, called *Stark-locks*, *Chamber-door Locks*, called *Spring-locks*, *Cupboard Locks*, *Chest Locks*, *Trunk Locks*, *Pad-locks*, &c. So are there several Inventions in *Locks*, I mean in the making and contriving their *Wards* or *Guards*. But these contrivances being almost innumerable, according to the various fancies of men, shall be referred to another time to discourse: And I shall now shew you the working of a *Spring-lock*, which when you know how to do, your Fancy may play with inventions as you best like.

In *Fig. 2.* A A A A the *Main-plate*, B C the *Key-hole*, E D E the *Top-bolt*, E E *Cross wards*, F the *Bolt*, G the *Bolt-rod*, or *Pole-Nail*, H the *Draw-back spring*, I the *Tumbler*, K the *Pin of the Tumbler*, L L the *Scraps*.

In *Fig. 3.* A A A A the *Cover-plate*, B the *Pin*, D C D the *Main-*

Main-ward, DD Cross wards, E the Steep ward, or Dap ward.

In Fig. 4. A the *Pin-hole*, B the *Steep or Dap ward*, C the *Hook-ward*, D the *Middle or Main-Cross-ward*, E E the *Cross-ward*, F the *Main-ward*, G G *Cross-ward*, H the *Shank*, I the *Per or Bead*, K the *Bow-ward*, L the *Bow*, B C D E E F G G the *Bit*.

First, cut out of an Iron plate with a *Gold Chissel* the size and shape of the *Main-plate*, as you were taught to cut the *Cross* and *Tail-piece* of the *cross garnet*: then consider what depth you intend the *Bit* of the *Key* shall have, and set that depth off on the *Main-plate* by leaving about half an inch of plate between the bottom of the *Key-hole*, and the lower edge of the *Main-plate*, as at ^c (or more or less according to the size of the *Lock*.) Then measure with a pair of *Compasses* between the bottom of the *Bit* and the *Centre* of your *Key* (or your intended *Key*) and set that distance off from C to B near the middle between the two ends of the *Main-plate*, and with the ^a *Prick-punch* make there a mark to set one foot of your *Compasses* in, then opening your *Compasses* to the middle of the *Bit* of your intended *Key*, as to D, describe the arch E D E for the true place the *Top-hoop* must stand on.

Then cut out another piece of plate as AAAA in fig. 3. for a *cover-plate* with two pieces one on each side long enough to make *Studs* of to turn downwards, and then outward again as F F G G that the *cover-plate* may stand off the *Main-plate* the breadth of the *Bit* of the *Key*: and at the two ends of these *Studs* punch holes as G G to rivet the *cover-plate* upon the *Main-plate*. In the middle of this Plate make the *Centre*, as at B, then open your *Compasses* to three quarters the length of the *Bit*, and half the diameter of the *Shank* of the *Key*, and placing one foot in the point B, describe with the other foot the arch D C D for the

the true place of the *Main-ward*, then set your *Compass* to a little more than half the diameter of the *blank*, and place one foot (as before) in the centre B, and with the other foot describe the small arch E for the true place the *step-ward*, or (as some call it) the *Dap-ward* must stand: So have you the true places of all the *wards* for an ordinary *Spring-lock*: you may (if the depth of your *Bit* will bear it) put more *wards* into your plates. But you must note, that the more *wards* you put in, the weaker you make your *Key*: because that to every *ward* on the Plates you must make a slit or *ward* in the *Bit* of the *Key*; and the more *wards* you make, the weaker the *Iron* of the *Bit* will be; and then if the *Bolt* shoot not easily backwards or forwards the *Bit* may be in danger of breaking.

Having marked on your Plates the places of all your *wards* you must take thin *Iron plate*, and with *Hammering* and *Filing* make them both ^b *Hammer-hard*, and of equal thickness all the way. Then *file* one edge very straight by laying a *straight ruler* just within the edge of it, and drawing or racing with a point of hardened Steel a bright line by the side of the *Ruler*: *file* away the edge of the Plate to that line, then draw (as before) another straight line parallel to the first straight line, or which is all one, parallel to the filed edge, just of the breadth you intend the *wards* shall be, and file it as before, only, you must leave two, or sometimes three *studs* upon this Plate, one near each end, and the other in the middle, to *rivet* into the *Main-plate*, to keep the *ward* fixt in its place. Therefore you must take care when you elect this thin piece of Plate, that it be broad enough for the *ward* and these *Studs* too. Then laying the Plate athwart the *Pike* of the *Bickern* hold your hand even with the face of the *Bickern*, and hammer this Plate down somewhat by the side of the *Pike*, and by degrees you may (with care taken) bring it unto a Circular form, just of the size of that Circle you described on the *Main-plate*; which

when you have done, you must apply this *ward* to the Circle you described on the *Main-plate*, setting it in the position you intend it shall be fixed, and marking with a Steel point where the *studs* stand upon that Circle, in those marks *punch* holes to *river* the *studs* to. Work so by all the other *wards*.

If you have a *Pin* to the *Lock*, *Punch* a hole through the *Centre* on the *cover-plate*, somewhat smaller than the *wyre* you are to make your *Pin* of, because you may then *file* one end of the *Pin* away to a *shank*, which must fit the smaller hole on the *Plate*, and the whole thickness of the *Pin* will be a *shoulder*, which will keep the *Pin* steady in the *centre-hole* of the *Plate*, when the *Pin* is *rivetted* into the *Plate*. But because there is some skill to be used in *Rivetting*, I shall before I proceed any further teach you

The manner of Rivetting.

Rivetting is to batter the edges of a *shank* over a *Plate* or other *Iron* the *shank* is set into, so as the *Plate* or other *Iron* may be clinched close and fixed between the battering at the end of the *shank* and the *shoulder*. So that

When you *river* a *Pin* into a hole, your *Pin* must have a *shoulder* to it thicker than the hole is wide, that the *shoulder* slip not through the hole as well as the *shank*: But the *shank* of the *Pin* must be exactly of the size of the hole the *shank* must be *rivetted* into, and somewhat longer than the *Plate* is thick: *file* the end of the *shank* flat, so shall the edges of the end the easilier batter over the *Plate*: then put your *shank* into the hole wherein it is to be *rivetted*, but be sure you force the *shank* close up to the *shoulder*: then turn the top of this *shoulder* downwards (*Plate* and all) upon your *stake*, but lay it so as that the *shoulder* lye solid and the *shank* at the same time stand directly upright, and with your left hand keep your work bearing hard upon the flat or face of the *stake*: Then holding your *Hammer* in your right hand, hold the edge

edge of the *face* of it dripping a slope from the right hand outwards, & lay pretty light blows upon the edge of the end of the *shank*, turning with your left hand your work round to the *face* of the *Hammer*, till you have battered the edges of the *shank* quite round about: But this is seldom done with once turning your work about; therefore you may thus work it round till you find it is pretty well *rivetted*: then lay heavier blows upon it, sometimes with the *face*, sometimes with the *pen* of the *Hammer*, till the end of the *shank* is battered effectually over the plate.

One main Consideration in *Rivetting* is, that the *Pin* you *rivet* in, stand upright to the plate, or other iron you *rivet* it upon: for if it do not stand upright you will be forced to set it upright after it is *riveted*, either in the *Vice* or with your *Hammer*, and that may, if your Plate be thin, bow it, or if it be thick break the *shank* or else the *shoulder* of your *rivet*, and so you lose your labour, and sometimes spoil your work.

Another Consideration is, that when you *rivet* a *Pin* to any Plate, and you fear it may afterwards twist about by some force that may be offered it, you must, to provide against this danger, *file* the *shank* you intend to *rivet* either square or triangular, and make the hole in the Plate you *rivet* it into of the same size and form, and then *rivet* in the *shank* as before. There are two ways to make your hole square or triangular, one is by *filing* it into these forms when it is first punched round; the other by making a *Punch* of Steel of the size and shape of the *shank* you are to *rivet*; and *punching* that *Punch* into the Plate, make the same form.

Now to return where I left off. The *Pins* or *shanks* of these *wards* must be made of a long square form, because, (the Plates of these *wards* being thin) should you make them no broader than the Plate is thick, the *studs* or *shanks* would be too weak to hold the *wards*, therefore you must make the *rivetting shank* three or four times, or sometimes more, as broad as the Plate is thick, and then *rivet* them in, as you were taught just now.

Then

Then place the *Cover-plate* upon the *Main-plate*, so as the *Centre* of the *Cover-plate* may stand directly over and against the *centre* of the *Main-plate*, and make marks through the hole GG, of the *studs* of the *cover-plate* upon the *main-plate* and on those marks punch holes, and fit two *pins* into them to fasten the *cover-plate* on to the *main-plate*, but you must not yet *river* them down till the *key-hole* be made, because this *cover-plate* would then stop the progress of the *file* through the *Main-plate*. When you have placed the *cover-plate* upon the *main-plate*, and fitted it on with *Pins*, so, as you may take it off and put it on again as your work may require, you must *punch* the *key-hole*, or rather *drill* two holes close by one another, if the *key-hole* falls near the *wards*, because *punching* may be apt to set the *wards* out of form, and with small *files*, file the two holes into one another to make the hole big enough to come at with bigger *files*, and then file your *key-hole* to your intended size and shape.

The *key-hole* being finished, Forge your *Key*, as you were taught, Numb. I. fol. 8. and if your *Key* is to have a *Pin-hole*, drill the hole in the middle of the end of the *shank*, then file the *wards* or *slits* in the *Bit* with thin *files* at the same distances from the middle of the *Pin-hole* in the end of the *shank* (which is the same *centre* which was made before in the *Main-plate* on the *Cover-plate*) which you placed the *wards* at from the *centre* of the *Main* and *cover-plate*. But before you file these *wards* too deep into the *bit* of the *Key*, make tryals, by putting the *bit* into the *key-hole*, whether the *wards* in the *bit* will agree with the *wards* on the *Plates*, which if they do, you may boldly cut them to the depth of the *wards* on the *Plates*; if not, you must alter your course till they do: but you must take great care in cutting the *wards* down straight and square to the sides of the *bit*; for if they be not cut down straight, the *wards* on the *Plates* will not fall in with the *wards* in the *bit* of the *Key*; and if they be not square to the sides of the *bit*, the
bit

bit will not only be weaker than it need be, but it will shew unhandsonely, and like a borch to the eye.

The *Cross* and *Hook-wards* is made, or at least entered at the *Forge*, when the Iron hath a *blond* or almost a *flame heat*, with a thin *Chissel* as you were taught Numb. I. fol. 11, 12. But you must take care that your *Chissel* be neither too thick or too broad, for this punching of *wards* is only to give the thin *files* entrance to work; which entrance when you have, you may easily *file* your *Cross* or *Hook-wards* wider or deeper as your work may require: But if your *Chissel* be too broad or too thick, it will make the *wards* in the *Bit* too long or too wide, and then (as I said before,) the *Bit* of your *Key* will prove weaker than it needs to be.

Having made the *wards* on the *Plate* and in the *Bit* of the *key*, you must *Forge* the *Bolt* of a considerable substance, thick and square at the end that shoots into the *staple* in the frame of the door, that it may be strong enough to guard the whole door; But the rest of the *Bolt* that lies between the two *Staples* on the *Main-plate* may be made very thin inwards, that is the side that lies towards the *Main-plate*, which because it cannot be seen when the *bolt* is fixed upon the *Plate*, I have made a Figure of it, and turned the inside to view, as in *fig. 4.* where you may see that the end A hath a considerable substance of Iron to guard the whole door as aforesaid, and B is a square *stud* which doth as well keep the outside flat of the *bolt* on the range, as serve for a *stud* for the *spring* H in *fig. 2.* to press hard against, and shoot the *Bolt* forwards: This *Bolt* must be wrought straight on all its sides, except the *Topside*, which must be wrought straight only as far as the *shoulder* G called the *Toe* or *Nab* of the *Bolt*, which rises as you see in the Figure considerably high above the straight on the *Top* of the *Bolt*: The office of this *Nab* is to receive the bottom of the *Bit* of the *key* when in turning it about it shoots the *Bolt* backward or forwards.

Having *Forged* and *filed* the *Bolt*, you must fit the hollow side:

side of it towards the *Main-plate*, at that distance from the *Key-hole*, that when the *key* is put into the *key-hole* and turned towards the *Bolt*, the bottom of the *Bit* may fall almost to the bottom of the *Nab*, and shoot the *Bolt* back so much as it needs enter the *Staple* in the door frame. And having found this true place for the *Bolt*, you must with square *Scaples*, just fit to contain the *Bolt* with an easie play, fasten these *staples* by rivetting them with the *Bolt* within them, one near the *Bolt* end, the other near the *Nab* end, as at N N to the *Main-plate*.

Then punch a pretty wide hole in the *Main-plate*, as at K, to receive a strong *Pin*, and file a *shoulder* to the *shank* of the *Pin* that goes into the *Plate*: This *Pin* is called the *Pin of the Tumbler*: The *Tumbler* is marked I, which is a long piece of Iron with a round hole at the Top to fit the *Pin* of the *Tumbler* into, that it may move upon it as on a *fernt*, and it hath an *Hook* returning at the other end of it, to fall into the breach of the *Bolt*, and by the *spring* H forces the *Bolt* forwards when it is shot back with the *key*. This *spring* is made of Steel, and afterwards temper'd (as I shall shew you in proper place:) It is fixed at the bottom of the *Main-plate*, by two small *shanks* proceeding from that edge of the *spring* that lies against the *Main-plate* as at O O: These *shanks* are to be rivetted (as you were taught even now) on the other side of the *Main-plate*.

All things being thus fitted Punch an hole on each corner of the *Main-plate* for *Nails* to enter that must nail the *Lock* to the *Door*. Or if you intend to screw your *Lock* on the *Door* you must make wide holes, big enough to receive the *shank* of the *Screw*. Last of all Rivet down your *cover-plate* to the *Main-plate*, and file your *key*, and polish it too if you will, so shall the *Lock* and *key* be finished.

^a A *Prick-punch* is a piece of temper'd Steel with a round point at one end, to prick a round mark in Cold iron.

^b *Hammer-hard* is when you harden Iron or Steel with much Hammering on it.

The

The making of Screws and Nuts.

THe *Shank* of the *Screw* for *Doors* and many other purposes must be *Forged* square near the *Head* , because it must be let into a square hole that it may not twist about when the *Nut* is turned about hard upon the *screw-pin* . Therefore take a square bar or rod of *Iron* as near the size of the *Head* of the *screw-pin* as you can, and taking a *flame-beat* of it lay so much of this *Bar* as you intend for the length of the *Shank* , with one square side flat, upon the hither side of the *Anvil* , and hammer it down to your intended thickness: But have a care you do not strike your *Iron* on this side the edge of the *Anvil* , lest you cut the *Iron* , as I told you *Numb. I. fol. 11.* Thus at once you will have two sides of your *Shank* forged; the under-side made by the *Anvil* and the upper side beaten flat with the *Hammer* : The *Head* will be in the *Main Rod* of *Iron* , then if your *iron* grows cold, give it another *beat* , and lay one of the un-wrought sides upon the hither side of the *Anvil* just to the *head* , and hammer that down as before, so shall the two other square sides be made: then hammer down the corners of so much of this *Shank* as you intend for the *screw-pin* , and round it as near as you can with the *hammer* ; set then the *Chissel* to the thickness you intend the *head* shall have, and strike it about half through, then turn the sides successively, and cut each side also half through till it be quite cut off: If the *sholder* be not square enough, hold it in your *square-nos'd Tongs* , and take another *beat* , and with speed (lest your work cool) screw the *Shank* into the *Vice* , so as the *sholder* may fall flat upon the *Chaps* of the *Vice* , then hammer upon the *head* and square the *sholder* on two sides, do the like for squaring the other two sides. This was in part taught you before, in *Numb. I. fol. 11.* but because the cutting this *iron Rod* or *bar* , just above the *sholder* makes the *head* , and

for that I did not mention it there, I thought fit (since the purpose required it) to do it here: The Forging of the *Nuts* are taught before, Numb. I. fol. 11, 12.

Having Forged and Filed your *shank* square, and the *head* either square or round, as you intend it shall be, file also the *screw-pin*, from the risings and dents left at the Forge; and file it a little tapering towards the end, that it may enter the *screw-plate*: The Rule how much it must be tapering is this, consider how deep the inner grooves of the *screw-plate* lye in the outer *threads*, and file the end of the *screw-pin* so much smaller than the rest of the *screw-pin*, for the outer *threads* of the *screw-plate* must make the Grooves on the *screw-pin*, and the Grooves in the *screw-plate* will make the *threads* on the *screw-pin*. Having fitted your self with a hole in your *screw-plate* (that is such a hole whose diameter of the hollow grooves shall be equal to the diameter of the *screw-pin*, but not such an hole whose diameter of the outer *threads* shall be equal to the diameter of the *screw-pin*, for then the *screw-plate* will indeed turn about the *screw-pin*, but not cut any grooves or *threads* in it) screw the *shank* with the head down-wards in the Vice, so as that the *screw-pin* may stand directly upright, and take the handle of the *screw-plate* in your right hand, and lay that hole flat upon the *screw-pin*, and press it pretty hard down over it, and turn the *screw-plate* evenly about with its handle towards you, from the right towards the left hand, so shall the outer *threads* of the *screw-plate* cut grooves into the *screw-pin*, and the substance of the Iron on the *screw-pin* will fill up the grooves of the *screw-plate*, and be a *thread* upon the *screw-pin*. But take this for caution, that as I told you you must not make your *screw-pin* too small, because the *screw-plate* will not then cut it, so if you make it too big (if it do enter the *screw-plate* where it is taper) it will endanger the breaking it, or, if it do not break it, yet the *screw-plate* will after it gets a little below the tapering

go no further, but work and wear off the *thread* again it made about the tapering.

As the *hole* of the *screw-plate* must be fitted to the *screw-pin*, so must the *screw-tap*, that makes the *Screw* in the *Nut*, be fitted to the round *hole* of the *Nut*, but that *Tap* must be of the same size of your *screw-pin* too, which you may try by the same *hole* of the *screw-plate* you made the *screw-pin* with. Screw the *Nut* in the *Vice* directly flat, that the *hole* may stand upright, and put the *screw-tap* upright into the *hole*: then if your *screw-tap* have an *handle*, turn it by the *handle* hard round in the *hole*, so will the *screw-tap* work it self into the *hole*, and make *grooves* in it to fit the *threads* of the *screw-pin*. But if the *screw-tap* have no *handle*, then it hath its upper end filed to a long square, to fit into an hollow square, made near the *handle* of the *screw-plate*: Put that long square hole over the long square on the top of the *tap*, and then by turning about the *screw-plate*, you will also turn about the *tap* in the *hole* and make *grooves* and *threads* in the *Nut*.

But though small *Screws* are made with *screw-plates*, yet great *Screws*, such as are for *Vices*, *Hot-Presses*, *Printing-Presses*, &c. are not made with *Screw-plates*, but must be cut out of the main iron, with heavy blows upon a *Cold-Chissel*: The manner of making them is as follows.

The Rules and manner of cutting Worms upon great Screws.

THe *Threads* of *Screws* when they are bigger than can be made in *Screw-plates* are called *Wormes*. They consist in length, breadth and depth: the length of a *Worm* begins at one end of the *Spindle* and ends at the other: the breadth of the *Worm* is contained between any two *Grooves* on the *Spindle*, viz. the upper and under *Groove* of the *Worm* in every part of the *Spindle*: The depth of the *Worm* is cut into the diameter of the *Spindle*, viz. the depth between

the outside of the *worm* and the bottom of the *Groove*.

Consider therefore the diameter of the *Spindle*, and allow about one fifth part of it for the breadth of a *Worm* and *Groove* together. This fifth part must be divided into two parts, but not two equal parts, the biggest part for the width of the *Groove*, between *Worm* and *Worm*, and the lesser part of the breadth of the *Worm* between *Groove* and *Groove*: You ought to make the *Groove* wider than the *Worm*, is broad, because the *Worm* being cut out of the same intire piece with the *spindle*, will be as strong as the *Worm* in the *Nut*, though the *Worm* on the *spindle* be smaller, for you cannot come at the *Worm* in the *Nut* to cut it with *files* as you may the *spindle*, and therefore you must either *turn up* a rod of iron to twist round about the *grooves* on the *spindle*, and then take it off and *braz*e it into the *Nut*, or else you must Cast a *Nut* of *Brass* upon the *spindle*, which will neither way be so strong as the *Worm* cut out of the whole *Iron*, by so much as *Brass* is a weaker metal than *Iron*, and therefore it is that you ought to allow the *Worm* in the *Nut* a greater breadth than the *Worm* on the *spindle*, that the strength of both may as near as you can be equallized: for both being put to equal force ought to have equal strength.

Having considered what breadth the *Worm* on the *spindle* shall have, take a small thin plate of *Brass* or *Iron*, and *file* a square notch at the end of it, just so wide and so deep as your *Worm* is to be broad and deep, and *file* the sides of the plate that this notch stands between just to the width of the *Groove*. This plate must be a gage to *file* your *Worm* and *Groove* to equal breadth by: then draw a straight and upright line the whole length of the *spindle*, divide from this line the Circumference of the whole *spindle* into eight equal parts, and through those divisions draw seven lines more parallel to the first line: Then open your *Compasses* just to the breadth of one *Worm* and one *Groove*,
and

and set off that distance so oft as you can, from the one end of the *spindle* to the other (but I should first have told you that the end of your *spindle* must be truly square to the outside) and with a *Prick-punch* make a mark to every setting off on that line, do the like to all the other straight upright lines. Note that you may choose any of these eight upright lines for the first, and make the next towards your left hand, the second (but then the first must stand towards you) and the next that, the third, and so on. And the top mark of every one of these upright straight lines shall be called the first mark, the next under that the second mark, the third the third mark, and so downwards in order and number.

Having marked one of these eight lines at the top of the *spindle* to begin the winding of the *Worm* at, with a black lead Pencil draw a line from that mark to the second mark on the next upright line towards the left hand, from thence continue drawing on with your Pencil to the third mark, on the third upright line, draw on still to the fourth mark on the fourth upright line, and so onwards till you have drawn over the eight straight lines, which when you have done you must still continue on drawing down-wards to each lower mark on each successive upright line, till you have drawn your *Worm* from end to end : Then examine as well as you can by your Eye, whether the *Worm* you have carried on from mark to mark, do not break into Angles, which if it do any where you must mend it in that place. Then with the edge of an *half round file*, file a small line in that black lead line, and be sure that the line you are filing run exactly through all the marks that the black-lead Pencil should have run through (if it did not for want of good guidance of hand) This small line is only for a guide to cut the *Groove* down by : for the making a Screw is indeed nothing else but the cutting the *Groove* down, for then the *Worm* remains : But you must not file in this small line, but leave it as a guide

guide to lye on the middle of the *Worm* (as I said before) Therefore to cut down the *Groove*, take a *flat file* somewhat thinner than you intend the *Groove* shall be wide, viz. about the thickness of the breadth of the *Worm*. The reason why you should not offer to cut the *Grooves* to their full width at the first, is, because your hand may carry the *file* somewhat awry, and should your *file* be as thick as the *Groove* is wide, you could not smooth the irregularities out without making the *Worm* narrower than you intended it: with this *file* therefore file in the middle between two fine lines cut by the *half-round file*, till you have filed the *spindle* from end to end, so shall the *Worm* remain. But you must not expect that though the *Groove* be cut, it is therefore finished, for you must now begin to use the *thin plate gage*, and try, first whether the *Worm* have equal breadth all the way: secondly, whether the *Groove* have equal breadth all the way: and thirdly, whether the *Groove* have equal depth all the way; and where ever you find the *Worm* too broad, you must file it thinner, and where the *Groove* is not deep enough, file it deeper: therefore in cutting down the *Groove* you may observe, that if at first you file the *Worm* ne'er so little too narrow, or the *Groove* ne'er so little too deep, you shall have all the rest of the *Worm* or *Groove* to file over again, because the whole *Worm* must be wrought to the breadth of the smallest part of it, and the whole *Groove* to the depth of the deepest place all the way, especially if the *Nut* be to be *Cast* in *Brass* upon the *spindle*; because the *Metal* running close to the *spindle* will bind on that place and not come off it: but if the *Nut* be not to be *cast* in *Brass*, but only hath a *Worm braz'd* into it, this niceness is not so absolutely necessary, because that *Worm* is first *turned up* and bowed into the *Grooves* of the *spindle*, and you may try that before it is *braz'd* into the *Nut*, and if it go not well about, you may mend it either by *hammering* or *filing* or both.

The

The manner of *Casting* the *Nut* upon the *spindle*, I shall shew when I come to the *Casting of Metals*, and the manner of *Brazing* hath been taught already, *Numb. I. fol. 12, 13.*

If your *spindle* is to have three or four *Worms* winding about it, as *Coyning-Presses* and *Printing-Presses* have, that they may come quickly down, and fly back of themselves, you must divide the Circumference into three or four equal parts, and having straight upright lines, drawn as before, begin a *Worm* at each of those three or four divisions on the Circumference, and having considered the breadth of your *Worm*, and width of your *Groove*, measure that width so oft as you can on all the upright lines, and making marks on those, at each setting off draw as before, a line from the end of the *spindle*, on the first upright line to the mark below it, which is the second mark on the second upright line. from thence to the third mark on the third upright line, and so on to the other end of the *spindle*. Having drawn the first *Worm*, work the other *Worms* as this.

Thus much may at present suffice for *great Screws*: when I come to exercise upon *Printing*, I shall be more copious, on Rules for *Printing-Presses*.

MECHANICK EXERCISES,

O R,
The Doctrine of
Handy-works,

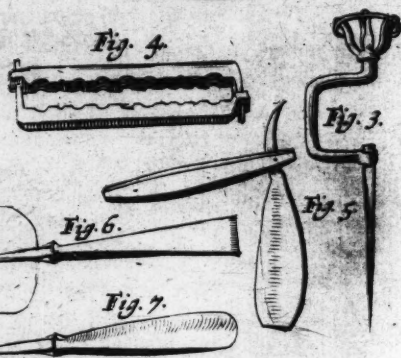
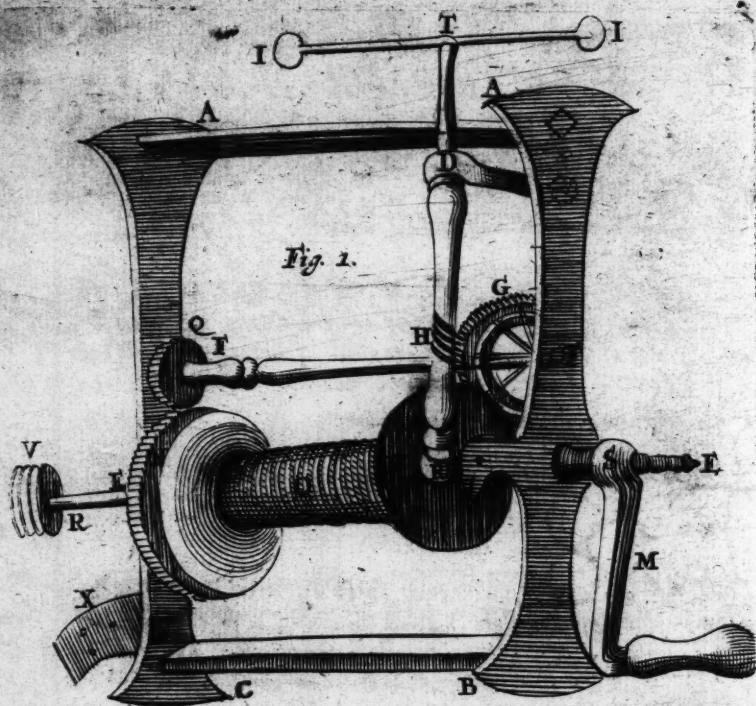
*From Feb. 1. 1677. to March 1. 1677. And
is intended to be Monthly continued*

By *Joseph Moxon* Hydrographer to the
King's most Excellent Majesty.



LONDON,

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MECHANICK EXERCISES,

O R,

The Doctrine of *Handy-Works*.

Viz. *The making of Jacks, and Bullet Molds, the twisting of Iron, and Case hardning it, with the use of some Tools not treated of before: Also of the several sorts of Steel, the manner Softening, Hardning, and tempering them.*

of Jacks.

Fig 1. is called a *Worm-Jack*. AB the *Fore-side*, AC the *Back-side*, AA the *Top-peece*, BC the *Bottom-peece*, altogether the *Jack frame*, EEK the *Main Spindle*, NON the *Main-wheel and Barrel*, O the *Barrel*, D the *Wind-up-peece*, fastned into the *Barrel*, FF the *Worm-wheel-Spindle*, G the *Worm-wheel*, Q the *Worm-Nut*, H the *Worm*, R the *Stud of the Worm-Spindle*, D the *Worm-loop*, L the *Wind-up-peece*, M the *Winch, or Winder, or Handle*, the Iron part is the *Winder*, the Wood the *Handle*, S the *Eye of the Winder*, II the *Fly*, T the *Socket of the Fly*, V the *Struck-wheel*, X the *Stages, or Back-fastnings*.

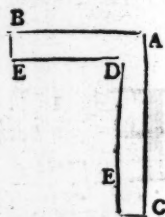
First you are to forge the *Jack-frame*, and on the left side of the *Fore side* a *Shank* for the *Stud* of the *Worm Spindle*, as you were taught, *Numb. I. fol. 8, 9, 10, 11, 12.* and then file it, as you were taught, *Numb. I. fol. 14, 15, 16.*

The *Top* and *Bottom peeces* are let into square holes at the ends

ends of the *Fore* and *Backsides*. But you must Forge the *Top* and *Bottom peeces* with two small Squares towards the ends of them, and two round ends for *Screw pins*, beyond those squares. The small squares are to be fitted into square holes in the *Fore* and *Backsides*, and the round *Screw pins* are to make *Screws* of, to which a square *Nut* is to be fitted to draw the *Top* and *Bottom peeces* close and tight up to the insides of the *Fore* and *Backsides*. The manner of filing of these square ends you were in part taught, *Num.I. fol. 15, 16.* and *Num.II. fol. 29.* but another way is by trying your work with an instrument called by Work-men a *Square*, as you see described in this figure.

Of the Square and it's Use.

The sides ABC are called the *Outer Square*: the sides DEF the *Inner Square*. Its use is thus, if your work (as in this case) be an outer square you must use the *inner Square* DEF to try it by; applying either the side ED, or DF (but suppose the side ED) to one of the sides of your work (choose the flattest and truest wrought) if none of the sides be flat, make one of them flat, as you were taught, *Numb.I. fol. 15, 16.* if then you find the side DF of your *Square* lye all the way even upon the adjoining side of your work, you may conclude those sides are square: but if the adjoining side of your work comply not all the way with the adjoining side of the *Square*, you must file away your work where the square rides upon it till the whole side be wrought to comply with the adjoining side of the *Square*, that is, till both the sides of your work agree with both the sides of the *Squares* when they are applied to one another. Having tryed two sides square, make a third side of your work square by applying one of the sides of the *Square* to one



one of those sides of your work, that are already made square; and (as before) try the third untryed side, and make that square: and by the same rule make the fourth side square.

If the work you are to file be an hollow square, you must apply the outer square *A B C* to it, and try how, when one side of the *Square* is applyed to one side of your work, the other side of your work agrees with the other side of the *Square*; which if it do all is well: but if the *Square* and the work comply not with one another, you must file your work, where it bears the *Square* off. But to return where I left off.

Having made these two ends square, you must fit the length of them to the thickness of the *Fore* and *Backsides* into which they are to enter, but so as the squares be not full so long as to come quite through the *Fore* and *Backsides*, lest when the *Nuts* are screwed on the *Screw pins* that are at the ends of these squares they Screw full up to the squares and bear against the corners of them, which if they do, the *Nuts* will not draw the *Fore* and *Backsides* close against the shoulders of the squares, on the *Top* and *Bottom peeces*, and then the whole *Jack frame* will not stand fast and firm together.

But before you fit this *Frame* thus together you must consider the Diameter of the *Main Wheel*, that you may punch round holes in the *Fore* and *Backsides* to enter the *Main-spindle*: Therefore open your *Compass* to half the intended Diameter of the *Main Wheel*, and half a quarter or an whole quarter of an inch more for play, between the Semi-diameter of the *Main Wheel*, and the upper flat of the *Bottom peeces*, and set that distance off from the upper flat of the *Bottom peeces*, on the *Fore* and *Backsides*, and with a round punch, somewhat smaller than the intended size of the *Main Spindle*, punch holes at that setting off. Your punch must be smaller than the *Main Spindle*, because the holes may perhaps not be so exactly round, or punched so truly upright or perfectly

perfectly smooth as they ought to be, and should you make the hole so wide at first as they need to be, you could not mend them without making them wider. These holes must be punched at the *Fire or Forge* (as Smith's say, when they take an *Heat* of their work to punch it) because the *Fore* and *Backsides* are too strong (as Smiths say) that is too thick to punch with the *Cold punch*. The way of punching them you were taught *Numb. I. fol. 11, 12*. Besides a *Cold punch* is commonly made flat at the bottom, and therefore does not prick an hole, but cut an hole (if the Iron be not too strong) for that flat bottom and the round upright side about it meet in an angle or edge at the bottom, which edge by the force of an Hammer cuts the Iron (if it be not too strong) when it is laid upon a *Bolster*, as it is described, *Numb. I. fol. 12*. and should you cut out so much Iron in the *Fore* and *Backsides* as would entertain the *Main Spindle* (it being thick) you would make the *Fore* and *Backsides* too much: therefore (as I said) the holes must be prickt in the *Fore* and *Backsides* at the *Fire or Forge*, which with a sharp pointed *punch* is sooner done: nor does pricking diminish the substance or strength of the Iron, but makes it swell out at the sides, and retain both substance and strength. The irregularity or swellings out that this punching makes on the flats of the *Fore* and *Backsides*, you must Hammer down again with almost a *Blood-red heat*: I say almost a *Blood-red heat*, because should you take too great an *Heat* you may make the *Fore* and *Backsides* stretch, and so put the whole *Jack frame* out of order.

Having puncht the holes for the *Main Spindle*, you must punch the holes in the *Fore* and *Backsides* for the *Worm Wheel Spindle*, as you puncht the holes for the *Main Spindle*: But these must be small holes, to entertain the small ends or *Pins* of the *Worm wheel Spindle*.

These holes thus puncht may perhaps not be exactly round, or fit to your size, nor will they be smooth enough within:
Therefore

Therefore with a ^aSquare bore you must^b open them wider to your size, and that opening them in the inside will both round and smoothen them.

You must also punch a square hole towards the top of the Fore side for the Shank of the Worm Loop.

Then forge and fit in your Main wheel Spindle, and your Worm wheel Spindle, which Spindles must both be exactly straight between the centers of their two ends (unless you like to have moldings for Ornaments on them) and forge a square towards the ends of both the Spindles to fit into a square hole in the middle of the Cross of their wheels, and leave substance enough for a shoulder beyond the square to stop the square hole in the Cross of the wheels from sliding further on the Spindle, and you must leave substance of Iron enough to forge the Nut of the Worm wheel near the other end. But in this and indeed in all other forging, remember, (as I told you Numb. I. fol. 9.) that it behoves you to hammer or forge your work as true as you can, lest it cost you great pains at the Vice.

Then forge the Worm Spindle, which is all the way round and straight, unless you will have moldings for Ornaments (as aforesaid) upon the Shank of it: But you must be sure to forge substance enough for the Worm to be cut out of it.

The Main and Worm wheels are forged round and flat.

The manner of Forging these Wheels (which in Smiths language is *Turning up the Wheels*, is first, to draw out a square Rod (as you were taught, Numb. I. fol. 9. among the several Heats of Iron) somewhat thicker than you intend your wheel shall be, but it must be almost as thin on one side as you intend the inner edge of the Wheel shall be, and the opposite to it above twice that thickness, for the outer edge of the Wheel (the reason you will find by and by). Having drawn forth your square Rod to a convenient length viz. almost three times the Diameter of your intended Wheel you must take almost a Flame Heat, and Hammer all along the whole length upon the thick edge, so will

H.

you.

you find the long Rod by this Hammering turn by degrees rounder and rounder in upon the thin edge, which you Hammer'd not upon, till it become a Circle or pretty near a Circle. But you must make it somewhat more than a Circle, for the ends must lap over one another, that they may be *welded* upon one another.

Thus may you see the reason for making the outer edge of the Rod thick, and the opposite edge thin: for your Hammering upon the outer edge onely, and not on the inner makes the outer edge a great deal thinner, and at the same time makes the *Wheel* broader.

The reason why I told you, you should draw forth the Rod to a'most three times the Diameter of the *Wheel*, and not to the Geometrical proportion is, because that in Hammering upon it to make it round, the Rod will stretch so considerably that it will be long enough to make a *wheel* of your intended Diameter, and most commonly somewhat to spare. But to return.

Before you take a *welding Heat* as by *Numb.I. fol. 9, 10.* you must flatten the two ends that are to be *welded* together to a little more than half their thickness, that when they are lapt over one another, and *welded* together they may be no thicker than the other part of the *Wheel*.

If the *Wheels* be not *Turned up* so round that with little labour you may mend them at the Vice, you must with *Blood-red Heats* Hammer them round upon the *Pike* or *Bickern* of the *Anvil*, holding with your *Tongs* the inner edge of the *Wheel* upon it, and Hammering upon the outer edge of the *Wheel*, till the *wheel* be fit for the *Vice*: Their insides must be divided into four equal parts, or four * *Dufftail* notches to be filed into them. The *Dufftail* notches are cut in the inner edge of the *wheel* towards the outer edge of the *wheel*, somewhat more than a quarter of an inch deep, and spreading somewhat wider towards the outer edge. These notches are to receive the four ends of a *Cross* forged somewhat

what thicker towards the ends than the thickness of the *wheel*, and must be filed outer *Duffrills* to let exactly into the inner *Duff-tail* notches made in the inside the *wheel*. They must be forged thicker than the *wheel*, because they must batter over both the flat sides of the *wheel* to keep the *wheel* strong and steady upon the *Cross*; and sometimes (for more security) they are brazed into the *wheel* (yet that is but seldome:) the middle of this *Cross* is made broad, that when the square hole is made in the middle of it to receive the square of the *Spindle*, it may have strength enough to bear the violence offered it, as well in winding up the great weight, that keeps the *wheels* in motion, as in the checking and turning the *Jack-winder* back, to set the *Jack* a going, when by the winding up it may be subject to stand still, or sometimes for want of weight, or else for want of oyling; or some other accident.

These *wheels* thus forged and filed flat must be divided, the *Main wheel* commonly, into 64 equal parts, and the *Vorm-wheel* into about thirty two equal parts: but these numbers are not exactly observ'd by Smiths, for sometimes they make them more and sometimes less, either according to the size of their *wheels*, or according as they intend their *wheels* shall go swifter or slower about (for the fewer the *Teeth* on a *wheel* are, the sooner the *wheel* goes about, and the more *Teeth* on a *wheel*, the slower the *wheel* goes about) or sometimes as they have opened their compasses to divide them: For if by luck they at first open their Compasses to such a width as will just measure out on a Circle (which they describe on the centre of the *wheel* for that purpose) their intended number, then the *wheel* shall have the intended number of *Teeth*; if not, let it somewhat fall short or exceed that number they matter not, but make that number of *Teeth* on the *wheel*. And having thus divided the *wheel*, they by the side of a straight Ruler laid to the centre, and every division mark on the *wheel*, draw or scratch a straight line from the outer limb of the *wheel* to the circle, which circle (I should have

told you before) is described at that distance from the outer Verge they intend the *Teeth* shall be cut down to. This is indeed a rough way of working, but the office of a *Jack* is well enough performed by this rough work; and the usual prizes such as will scarce pay workmen for better; as they say.

These *wheels* thus divided must be cut down into these divisions with a *Jack-file*, the *Main-wheel* straight athwart the outer Verge, (which to speak Mathematically makes an angle of 90 degrees with the flat sides of the *wheel*;) and the *VVorm-wheel* aslope, making an angle of about 115 degrees with its sides, that is, an angle of 25 degrees with a line drawn straight athwart the outer edge of the *wheel*, that the *Teeth* of the *VVorm-wheel* may gather themselves into the *Grooves* of the *VVorm* in the *VVorm-spindle*; the *VVorm* on the *Worm-spindle* running about 65 degrees aslope from the *Azis* or perpendicular of the *VVorm-spindle*. The notches you make with the *File* must be so wide, as to contain about twice the thickness of each *Tooth*: Therefore you may observe that the number of *Teeth* cannot be assign'd, because the sizes of all *Jack-wheels* are not of equal *Diameters*, and the sizes of the *Teeth* must be filed very square and smooth, and the corners taken off, and rounded on both sides towards the middle of the top or end of the *Tooth*, which much helps the *Teeth* to gather in upon the *Teeth* of the *Nut*, and the *Worm* on the *Worm-spindle*.

The *Teeth* of the *Wheels* being cut down, and the whole *wheel* finished, they must be forced stiff and hard upon the Square of the *Spindle*, close up to the *Shoulder*; which Square being made somewhat longer than the *Cross* of the *wheel* is thick, must with a *Cold-Chisel* be cut on the top of that square, to make the Iron that comes through the square hole of the *wheel* spread over the *Cross* of the *wheel*, and then that spreading must be battered with the *Pen* of the *Hammer*, that it may stand up stiff against the *Shoulder* of the square on the other side of the *wheel*: But in doing this, you must be very careful that the *Spindle* stand exactly perpendicular to the flat sides

sides of your *Wheels*; for should the *Spindle* lean never so little to one or the other side of the *wheel*, the *wheel* when it is moving in the *Jack frame* would not move perpendicularly, but wabble towards the *Fore* or *Backsides* of the *Jack frame*, and perhaps by this irregular motion, before a revolution of the *wheel* be performed, it would go off from the length of the *Teeth* of the *Nut*.

Then file the *Spindle pins* (which are the ends of the *Spindle*, that go into the center holes of the *Fore* and *Backsides* of the *Jack frame*) exactly round and fit to their center holes; and place them in their proper center holes. Then try if the *wheels* are exactly round on their outer edges, and that in turning about their flat sides wabble not, but in a revolution keep parallel to the *Fore* and *Backsides*. The way Smiths use to try them by, is to turn them about by the *Spindle*, and holding a peece of Chalk steady to the outer limb of the *wheel*, not letting the point of the Chalk slip forwards or backwards, or towards the right or left hand, for then if the Chalk make a white stroak round the whole *wheel*, and that white stroak lye exactly parallel to the two outer edges of the *wheel*, the *wheel* is not only round, but stands also true upon its *Spindle*, (that is) perpendicular to the *Spindle*, and the *Spindle* perpendicular to the flat of it: But if the Chalk does not touch round the whole *wheel*, you must file down so much of the the outer verge of the *wheel*: where the Chalk does touch as will bring down or equalize the Diameter of the *wheel* in that place to the Diameter of the *wheel* in the place where it does not touch; so may you conclude the *wheel* is round. If the mark of the Chalk lie not exactly in the middle between the two edges of the *wheel*, then it is not perpendicular to the *Spindle*, and you must with the Hammer set it right, that is, perpendicular, by forcing the *wheel* over from the side it leans too much to, or else by forcing the *Spindle*: which is all one; yet this is an help you ought not to rely upon, to use, but in case of necessity, but rather be sure your *wheel* and *Spindle* stand perpendicular to one another before you fasten

the *Wheel* upon the square of the *Spindle*, for by this help the square on the *Spindle* will be apt to loosen in the square of the *Wheel*, and you will have your *Wheel* to new fasten upon the square of the *Spindle* again.

As you tryed the *Wheels* with Chalk, so you must try the *Nut*, the *Worm*, and the *Spindles*.

The upper part of the *worm spindle* must be filed truly round to fit into the *Worm Loop*, that it shake not in it, and yet go very easily about, without the least stopping. At the very upper end of this round on the *Worm Spindle*, you must file a square to fit the square hole of the *Fly* upon.

The *Shank* of the *Worm Loop*, and the *Stud* of the *Worm Spindle* must stand so far off the left side of the *Fore side*, that the *Teeth* of the *Worm wheel* may fall full into the *Grooves* of the *worm*; for so, both being cur with the same slope, the slope *Teeth* of the *Worm wheel* will gather into the slope *Grooves* of the *Spindle*, and pressing upon the *Worm* drive about the *Worm Spindle* and the *Fly*.

The *Fly* is made sometimes with two, sometimes with four *Arms* from the center, and sometimes the *Arms* are made longer, sometimes shorter: The more *Arms* and also the longer *Arms*, are to make the *Jack* go slower.

There is yet a small matter more of iron work about the *Jack*, which is the *Tumbler*; but it lies in the further end of the *Barrel*, and cannot well be described without a particular figure, which therefore I have inserted. As in Fig 2. A the *Barrel*, B the *Main Spindle* coming through a *Barrel*, a the center of the *Tumbler* moving upon the *Center pin*, which is fastened into an Iron plate behind the *Barrel*. b The *Coller* upon the *Main Spindle*, from which proceeds a *Tongue*, which passes through a pretty wide hole at c in the *Tumbler*, as far as e d the *Catch* of the *Tumbler*. The *Tumbler* moves (as aforesaid) upon the center hole a, but receives the *Tongue* through it at c, and passes as far as e. This *Tongue* serves as a *Check* to the *Tumbler*, that it cannot tumble above an Angle

Angle of 20 degrees from the Iron plate it is fastened to; and that the width of its center hole, and the width of the hole the *Tongue* passes through, and the motion of the *Coller* about the *Main Spindle* allows it; but were the center hole *a*, and its *Center pin* fit, and the hole *c* and the *Tongue* that passes through it also fit, and the *Coller* fixt, it could not move at all. But this play is enough for it to do the purpose it is designed for. The *Tumbler* is so placed behind the *Barrel*, that while the *Jack line* is winding up upon the *Barrel* its round britch passes forwards by all the *Crosses* of the *Main wheel*, and the point or *Catch d*, as then claps it self snug or close to the Iron plate of the *Barrel*: But when the *Barrel* is turned the contrary way, the weight of the *Catch* in half a revolution of the *Barrel* (let the *Tumbler* be posited where it will) makes it open and fall from the Iron plate, and butt against one or other of the *Crosses* on the *Main Wheel*, and so thrusts the *Main Wheel* about with the *Barrel*.

The *Eye* of the *Winch* or *Winder* is forged as you were taught to forge the *Pin Hole* in the *Cross garnet*, Numb. II. fol. 18. But that was to be a small round hole, and therefore you were directed to lay a small round peece of Iron or Wyre where you intended the *Pin Hole* should be, and lap the other end of your work over it; But this is to be a wide square hole, therefore you must lay a square peece of Iron of your size, where the *Eye* of the *Jack Winch* shall be, and lap or double the other end over it, and *Weld* and *Work* as you were there directed. The rest of the *Winch* is but common *Forging* and *Filing* work, which hath been sufficiently taught already.

The Wood work belonging to a *Jack*, is a *Barrel*, a *Spindle*, and the *Handle of the Winch*; which being *Turners* work I shall say nothing to, till I come to the Art of *Turning*. Only those *wheels* that have more than one *Groove* in them are called *Two*, *Three*, &c. *Struck-wheels* in *Workmens* corrupting language; But, I suppose, originally two *Stroak*, three *Stroak-wheels*.

wheels, &c. from the number of *Grooves* that are in them.

The Excellencies of a good *Jack* are (1.) That the *Jack-frame* be forged and filed square, and conveniently strong, well set together, and will screw close and tight up. (2.) That the wheels be perpendicularly and strongly fixed on the squares of the *Spindles*. (3.) That the *Teeth* be evenly cut, and well smoothed, and that the *Teeth* of the *Worm-wheel* fall evenly into the *Groove* of the *Worm*. (4.) That the *Spindle-pins* shake not between the *Fore* and *Back sides*, nor are too big or too little for their center-holes.

^a The *Square-bore* is a square Steel point or shank, well temper'd, fitted into a square Socket in an Iron *wimble*: It is described, *fig. 3.* its use is to open a hole, and make it truly round, and smooth within, when you use it you must set the head against your Breast, and put the point of the *Square-bore* into the hole you punched or would open, and turning the Handle about you with it turn about the shank of the *Square-bore*, whose edges cut away the irregularities of the Iron made in the punching. But you must thrust or lean hard with your Breast against the Head of the *Square-bore*, that it may cut the faster: And you must be sure to guide the *Square-bore* truly straight forwards in the hole; least the hole be wrought aslope in the Iron.

^b To open an hole, is in Smiths language to make the hole wider.

^c A *Duff-tail* is a figure made in the form of a Doves tail, and is used by many other Handicrafts as well as by Smiths, but most especially by Joyners, as I shall shew, when I come to *Joynery*.

^d A *Jack-file* is a broad File somewhat thin on both edges, and stronger in the middle.

The manner of making Molds to cast Leaden Bullets in.

I insert the making of *Bullet-Molds*, because there is some sort of Work in them different from what hath yet been taught. The Handles and the Head are forged as other Work, but the

Numb. III.

two concave Hemispheres are first punched with a round ended *Punch*, of the shape and almost the full size you intend the *Bullet* shall be. They must be punched deep enough at the *Forge* with a *Blow-red Heat*: Then are the edges of the chaps filed flat, first with a Common file the common way, but afterwards with an *Uising File*, as Workmen call it: The *Uising File* is a long and broad file exactly flat on both its cut sides, having a square Iron handle drawn out at one end with an hole in it; but the handle is not to hold it by, when you use it, but the hole in it to go over a pin you hang it upon, when you do not use it. When you use it, you must lay it flat upon the Work bench, with its handle from you, and you must take care that it lie solid and steddly, lest when you work upon it, it slip from you; therefore you may strike a nail in at the hole of the Handle, a little way into the Work bench, that you may draw it again, when you have done with the *Uising File*, and you may drive in a small Tack on each side the *Uising File*, to keep it steddly, or you may tack down two small thin boards on either side the *Uising File*, to keep it steddly, and rip them off again when you have done. Your *Uising File* lying thus straight and steddly before you, lay the chaps of one half of the *Mold* flat upon the hither end of the *Uising File* and holding your two thumbs, and your two fore-fingers upon the Head of the *Mold*, thrust your work hard down from you the whole length of the *Uising File*, then draw your work lightly back, and thrust it again hard from you; reiterate these thrusts, thus till upon the chaps of the *Mold*, you can see no irregularities, or the File stroaks of the common File left, so may you be sure that the chaps of the *Mold* is truly flat. Do the like by the other half of the *Mold*.

Now you must try whether each of these Concaves be an exact half round; thus, you may describe an Arch a little more than a Semi-Circle, just of the Diameter of your *Bullet* upon the end of a thin peece of Brasse latten, draw a straight line

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through the Center and the Arch on both sides it, for the limits of a Semi-Circle: File very curiously all the Brass away on the end just to this Semi-Circle, and just to the Diametral line on either side the Semi-Circle; so have you a convex Semi-Circle: Put this convex Semi-Circle into the concave *Molds*, if it fits them so as the convex reaches just the bottom of the *Molds*, when its shoulder touches just the chaps of the *Mold*, they are each a true concave Hemisphere. But if the shoulder of the convex (that is the Diametral line prolong'd) rides upon the chaps of the concave, and the bottom of the convex touch not the bottom of the concave, the concave is punched too deep, and must have its chaps rubb'd upon the *Using File* again, till it comply with the convex. Then put into the two concaves a round *Bullet*, that will just fill them both, and pinching the Heads of the *Mold* close together in the *Vice*, with the *Bullet* in it, drill an hole through both the Handles for the *Joint*. The reason why the *Bullet* is put into the *Mold*, is because the chaps of the two halves should lie exactly upon one another, while the hole for the *Joint* is drilling. Then fit a rivet pin for this hole, and rivet them together, but not so hard but that they may open and shut pretty easie, and yet go true. Then take the *Bullet* out, and file in each half of the Head half a round hole directly against one another for the *Seat*, which two half holes, when the *Mold* is shut, will make one round hole.

You may now try with Clay, or by casting a leaden *Bullet* in it, whether it be exactly round or No; for making a true round hole in a thin peece of Brass, just of the circumference of the chaps, you may try if the cast *Bullet* will just pass through, and also fill that hole when the *Bullet* is turned every way: which if it do, you may conclude the *Mold* is true. This thin peece of Brass, with a round hole in it, is called a *Sizer*.

But the inside wants cleansing, for hitherto it is only punched. Therefore you must provide a *Bullet Bore*, with which you may bore the inside of each half to clear it. Or if they
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be not quite deep enough puncht you may bore them deeper. You may bore them severally or together, by putting the *Bullet bore* into the *Mold* so, as the *Shank* may come through the *Geat*.

In this Section you see, first the use of a *using File*, an Instrument of great use for flat Filing; for by it you may make two peeces of Iron of somewhat considerable breadth, so true that by laying the two flat sides upon each other, they shall draw up one another. It is much used by *Clock-makers*, *Watch-makers*, *Letter-Mold-makers*, and indeed all others that frame square work on Iron, Steel or Brass. Secondly, the use of a *Bullet bore*, which, though it be seldome used, yet it may serve you, not only for *Bullet Molds*, but for other purposes: and by altering it's shape into an Oblong, a Cone, or a Cylinder, you may Bore these hollow Figures either for *Molds*, or some other accidental uses.

▪ A *Geat* is the hole through which the Merral runs into the *Mold*. The word is used by most *Founders*.

▪ The *Bullet-bore* is a *Shank* of steel, having a steel Globe or *Bullet* at one end, just of your intended *Bullets* size. This Globular end must be hatcht with a fine-cut, by a *File-Cutter*, and hardned and tempered. The end of the *Shank* this Globular Bore is fastned to, must be round and so small when the *Bullet bore* is in the *Mold* the *Geat* will easily recieve it. The other end of the *Shank* must be fitted into the square Socket of the *Wimble*, and have a shoulder to it, to stop the Socket from sliding too far upon the *Shank*: From this shoulder the rest of the *Shank* must run tapering down to the small end the *Bullet bore* is fastned to. You must work with it as you were taught to work with the *Square bore*.

Of Twisting of the Iron.

Square and flat Bars sometimes are by Smiths *Twisted* for Ornament: It is very easily done; for after the Bar is square or flat forged (and if the curiosity of your work require it truly Filed) you must take a *flame Heat*, or if your work be small but a *Blood-red Heat*, and you may twist it about, as much or

as little as you please, either with the *Tongs, Vice, or Hand-vice, &c.*

Of Case Hardning.

Case Hardning is sometimes used by *File-cutters*, when they make coarse Files for cheapness, and generally most *Rasps* have formerly been made of Iron and *Case-hardned*, because it makes the outside of them hard. It is used also by *Gun Smiths* for hardning their Barrels: And it is used for *Tobacco Boxes, Cod-peece Buttons, Heads for walking staves, &c.* and in these Cases workmen, to set a greater value on them in the Buyers esteem, call them *steel Barrels, steel Tobacco Boxes, steel Buttons, steel Heads, &c.* But Iron thus hardned takes a better Pollish, and keeps the Pollish much longer and better, than if the Iron were not *Case-hardned*. The manner of *Case-hardning* is thus. Take *Cow-horn or Hoof*, dry it through'y in an Oven, and then beat it to Powder, put about the same quantity of Bay Salt to it, and mingle them together with stale Chamberley, or else with white Wine Vinegar. Lay some of this mixture upon Loam, made as you were taught, *Numb. I. fol. 13.* and cover your Iron all over with it; then wrap the Loam about all, and lay it upon the Hearth of the Forge to dry and harden: when it is dry and hard, put it into the Fire, and blow up the Coals to it, till the whole lump have just a Blood red heat, but no higher than a blood-red heat, least the quality of your mixture burn away, and leave the Iron as soft as at first. Then take it out and quench it. Or instead of Loam you may wrap it up in plate Iron, so as the mixture may touch every part of your Work, and blow the Coals to it, as aforesaid.

Of several sorts of steel in common use among Smiths.

The difficulty of getting good steel makes many Workmen (when by good hap they light on it) commend that Country steel for best from whence that steel came. Thus I have found some cry up *Flemish steel*, others *Swedish steel*, others *English, Spanish, Venice, &c.* But according to my observation

and the common consent of the most ingenious Workmen; each Country produces almost indifferently good and bad: yet each Country doth not equally produce such Steel as is fit for every particular purpose, as I shall shew you by and by. But the several sorts of Steel, that are in general use here in England, are the *English Steel*, the *Flemish*, the *Swedish*, the *Spanish*, and the *Venice Steel*.

The *English Steel* is made in several places in England, as in *Yorkshire*, *Gloucestershire*, *Sussex*, the *Wilde of Kent*, &c. But the best is made about the *Forrest of Dean*; it breaks fire with somewhat a coarse grain: But if it be well wrought and proves sound it makes good Edge Tools, Files, and Punches. It will work well at the forge, and take a good heat.

The *Flemish Steel* is made in Germany in the Country of *Stiermark*, and in the *Land of Luyck*: From thence brought to *Colen*, and is therefore sometimes called *Colen steel*: From *Colen* it is brought down the *River Rhine* to *Dort* and other parts of *Holland* and *Flanders*, some in *Bars* and some in *Gads*, and is therefore by us called *Flemish Steel*, and sometimes *Gad Steel*. It is a tough sort of Steel, and the onely Steel used for Watch-Springs. It is also good for Punches, File-Cutters also use it to make their Chisels of, with which they cut their Files. It breaks with a fine grain, works well at the Forge, and will take a welding heat.

I cannot learn that any Steel comes from *Sweden*, but from *Dantzick* comes some which is called *Swedish Steel*, it is much of the same quality and fineness with *Flemish Steel*.

The *Spanish Steel* is made about *Escany*. It is a fine sort of Steel, but some of it very difficult to work at the Forge, because it will not take a good heat and it sometimes proves very unsound, as not being well curried, that is well wrought. It is too quick (as Workmen call it) that is, too brittle for Springs or Punches, but makes good Edge Tools.

Venice Steel is much like *Spanish Steel*, but more fine, and works somewhat better at the Forge. It is used for Razors,

Chirurgeons Instruments, Gravets, &c. because it will come to a fine and thin edge. Razor-makers generally clap a small Bar of *Venite Steel* between two small Bars of *Flemish Steel*, and so work or weld them together, to strengthen the back of the Razor, and keep it from cracking.

There is another sort of Steel of higher commendations than any of the foregoing sorts. It is called *Damascus Steel*: It is very rare that any comes into *England* unwrought, but the *Turkish Symeters* are generally made of it. It is the most difficult of any Steel to work at the Forge, for you shall scarce be able to strike upon a blood heat, but it will *Red Scar* in so much that these Symeters are by many Workmen thought to be cast Steel. But when it is wrought it takes the finest and keeps the Strongest edge of any other Steel. Workmen set almost an inestimable value upon it, to make Punches, Gold-Punches, &c. of. We cannot learn where it is made, and yet as I am inform'd, the Honourable Mr. *Boyl* hath been very careful and industrious in that inquiry, giving it in particular charge to some Travellers to *Damascus* to bring home an account of it: But when they came thither they heard of none made there, but were sent about fifty miles further into the Country, and then they were told of about fifty miles further than that: so that no certain account could be gained where it is made.

The Rule to know good Steel by.

Break a little piece of the end of the Rod, and observe how it breaks: for good Steel breaks short off, all gray like frost work silver. But in the breaking of the Bad you will find some veins of Iron shining and doubling in the Steel.

Of Nealing of Steel.

Having chose your Steel and forged it to your intended shape, if you are either to file upon it, or to engrave upon it, or to punch upon it, you ought to Neal it first, because it will make it softer, and consequently work easier. The common way is to give it a blood red heat in the fire, then take it out, and let it cool of it self.

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There are some Pretenders to know how to make Steel as soft as Lead : But so oft as my curiosity has prompted me to try their pretended processes, so oft have they failed me ; and not only me, but some others, Careful Observers. But the Way they most boast of, is the often heating the Iron or Steel in red hot Lead, and letting it cool of it self, with the Lead. I have many times tryed this without any other success than that it does indeed make Iron or Steel as soft, as if it were well Neald the common way, but no softer : And could it be otherwise, the small Iron Ladles, that Letter-Founders use to the casting of Printing Letters, would be very soft indeed, for these iron Ladles are kept constantly month after month in melted Metall, whereof the main Body is Lead, and when they cast small Letters they keep their Metall red hot ; and I have known them many times left in the Metall, and cool with it as the fire has gone out of it self ; but yet the Iron Ladles have been no softer than if they had been well Neald the common way. But perhaps these pretenders mean the Iron or Steel shall be as soft as Lead, when the Iron or Steel is red hot.

But that which makes Steel a very small matter softer than the common way of Nealing is, by covering the Steel with a course Powder of Cow-horns or Hooves, or Rams-horns, and so inclosing it in Loam ; then put the whole lump into a wooden Fire to heat red hot, and let it lie in the Fire till the Fire go out of it self, and the steel cool with the Fire.

Of hardning and Tempering steel.

English, Flemish, and Swedish Steel must have a pretty high heat given them, and then suddenly quenched in water to make them very hard ; but *Spanish and Venice Steel*, will need but a Blood-red heat, and then when they are quenched in Water will be very hard. If your Steel be too hard, that is too brittle, and it be an edged or pointed Instrument you make, the edge or point will be very subject to break : Or if it be a Spring it will not bow, but with the least bending it will snap asunder : Therefore you must let it down, (as Smiths say) that is, make it softer,

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by *Tempering* it. The manner is thus, take a peece of Grin-stone or Vwet stone, and rub hard upon your work to take the black scurff off it, and brighten it: then let it heat in the Fire, and as it grows hotter you will see the colour change by degrees, coming first to a light Goldish colour, then to a darker Goldish colour, and at last to a Blew colour: ^{select} which of these colours your work requires, and then quench it suddenly in water. The light Goldish colour is for Files, Cold Chissels, and Punches that punch into Iron or Steel: The dark Goldish colour for punches to use on Brass, and generally for most edge Tools: The blew colour gives the Temper to Springs in general, and is also used to beautifie both Iron and Steel: but then Workmen sometimes grind *Indico* and salled Oyl together, and rub that mixture upon it, with a woollen rag while it is heating, and let it cool of it self.

There is another sort of hardning, called *Hammer hardning*. It is most used on Iron or Steel Plates, for Dripping-pans, Saws, straight Rulers, &c. It is perform'd onely, with well Hammering of the Plates, which both smooths them, and beats the Mettal firmer into its own Body, and so somewhat hardens it.

The manner of Forging steel, either for edge Tools, Punches, Springs, &c. Is (the several shapes considered) the same with Forging Iron: Onely this General Rule observe from an Old English Verse used among Smiths, when they Forge edge Tools,

*He that will a good Edge win,
Must Forge thick and Grind thin.*

Thus much of Smithing. Only, in the foregoing Exercises some mistakes have been committed. *Viz* Numb. I. fol. 2. l. 22. read, and hath one of its boards fixed. l. 20 for upper Board r. moving Board. l. 32. for upon it sinks r. the top of its upper Board sinks. In Numb. II. in fig. 2. of the Plate, in the Arch about B, two small strokes through the Arch are omitted, which should be marked E E, as in fig. 3. the Strokes D D are marked; and the letter D is omitted, which should stand in fig. 2. where C in fig. 3. stands. fol. 28 l. 10. for N N r. L L. The Wind-up-peece is twice mis-markt, viz. in Numb. III. fol. 37. l. 14. D for E, and l. 17. L for E the end of the Main-Spindle that comes through the fore-side Jack-frame, whereon the Jack-winder is fitted, is called the wind-up piece.

MECHANICK
EXERCISES,

OR,

The Doctrine of
Handy-works.

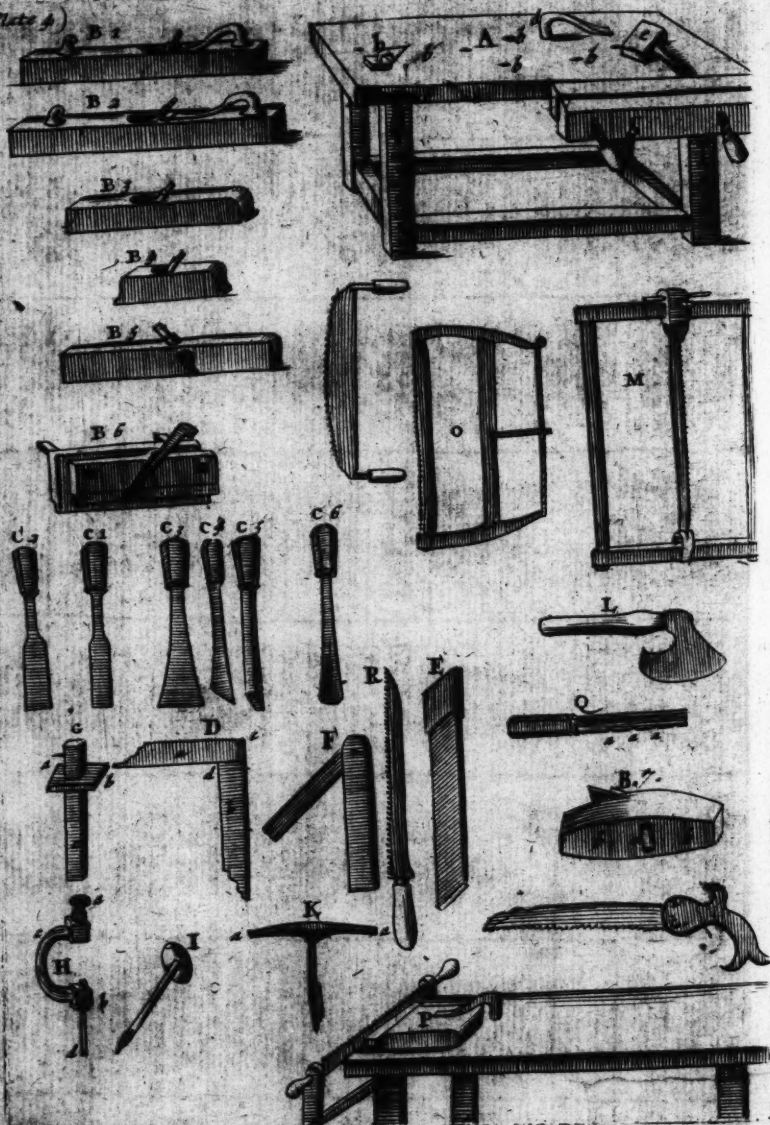
*From April the 1. to May the 1.
1678. And is intended to be
Monthly continued.*

By *Joseph Moxon* Hydrographer to
the King's most Excellent Majesty.



L O N D O N,
Printed for *Joseph Moxon*, at the Sign of *Atlas* on
Ludgate Hill. 1678.

Plate 4)



MECHANICK EXERCISES.

OR,

The Doctrine of Handy-works.

The Art of Joynery.

Definition.

Joynery is an Art Manual whereby several Pieces of Wood are so fitted and joyned together by straight Lines, Squares, Miters, or any Bevel, that they shall seem one intire Piece.

Explanation.

By *straight Lines* I mean that which in Joyners Language is called a *Foynt*, That is, Two Pieces of Wood are *Shot* (that is Plained,) or else they are *Pared*, that is, the irregularities that hinder the closing of the two Pieces are cut off with a *Paring Chisel*. They are *Shot* or *Pared* (as I said) so exactly straight, that when they are set upon one another light shall not be discerned betwixt them. This they call *Shooting of a Foynt*, or *Paring to a Foynt*, because these two Pieces are with Glew commonly joyned together, either to make a Board broad enough for their purpose, or to (^a) *Clamp* one piece of wood to the end of another piece of wood to keep it from *casting* or *warping*.

By *Squares* I mean the making of *Frames*, either for *Door-cases*, or such like, which is the Framing

L

of

of two pieces of wood athwart two other pieces of wood, so as the four Angles of the *Frame* may comply with the *Square*, marked D.

By *Miters* are meant the joyning of two pieces of wood, so as the Joynt makes half a Square, and does comply with the *Miter Square*, marked E.

By a *Bevil* is meant any other Angle: As *Frames* that may be made of *Pentagon*, *Hexagon*, *Octagon*, &c. Figures.

§ 1. The Names of *Joyners Tools* described.
In *Plate III.*

A *Work-Bench*. b The *Hook* in it, to lay Boards or other ^b *Stuff* flat against, whiles they are ^c *Trying* or *Plaining*. c The *Bench-Screw* (on its hither side) to Screw Boards in whiles the edges of them are *Plaining* or ^d *Shooting*; and then the other edge of the Board is set upon a *Pin* or *Pins* (if the Board be so long as to reach to the other *Leg*) put into the *Holes* marked a a a a a down the *Legs* of the *Bench*; which *Pin* or *Pins* may be removed into higher or lower *Holes*, as the breadth of the Board shall require: So then, the *Bench-Screw* keeps the Board close to the edge of the *Bench*, and the *Pins* in the *Legs* keep it to its height, that it may stand *Steddy* whiles the other edge is working upon: For in the *Shooting* of a *Joynt*, if the Board keeps not its exact position, but shakes or trembles under the *Plain*, your *Joynt* will very hardly be truly straight. d The *Hold fast*, let pretty loose into round holes marked b b b b b, in the *Bench*: Its office is to keep the work fast upon the *Bench* whiles you either *Saw*, *Tennant*, *Mortise*, or sometimes *Plain* upon it, &c. It performs this office with the knock of an *Hammer*.

mer or *Mallet* upon the *head* of it; for the *Beak* of it being made crooked downwards, the end of the *Beak* falling upon the flat of the *Bench* keeps the *Head* of the *Hold-fast* above the flat of the *Bench*, and the *hole* in the *Bench* the *Shank* is let into being bored straight down and wide enough to let the *Hold-fast* play a little, the *Head* of the *Hold-fast* being knockt, the point of the *Beak* throws the *Shank* a slope in the *hole* in the *Bench*, and presses its backside hard against the edge of the *Hole* on the upper Superficies of the *Bench*, and its Foreside hard against the opposite side of the under Superficies of the *Bench*, and so by the point of the *Beak* the *Shank* of the *Hold-fast* is wedged between the upper edge and its opposite edge of the round hole in the *Bench*. Sometimes a *double Screw* is fixed to the side of the *Bench* as at *g*: or sometimes its farther *Check* is laid an edge upon the flat of the *Bench*, and fastned with an *Hold-fast*, or sometimes two on the *Bench*. e A *Mallet*.

§ 2. BBBBBBBB *Plains* of several sorts: as,

B1 A *Fore Plain*. a The *Tote*. b The *Mouth*. c The *Wedge*. d The *Iron*. e The *Sole*. f The *Fore-end*, g The *Britch*. f g h The *Stock*. All together A *Plain*. It is called the *Fore Plain* because it is used before you come to work either with the *Smooth Plain* or with the *Joynter*. The edge of its *Iron* is not ground upon the straight, as the *Smooth Plain* and the *Joynter* are, but rises with a *Convex Arch* in the middle of it; for its Office being to prepare the *Stuff* for either the *Smoothing Plain* or the *Joynter*, Workmen set the edge of it e *Ranker* than the edge either of the *Smoothing Plain* or the *Joynter*, and should the *Iron* of the *Plain* be ground to a straight edge, and it be set

never so little *Ranker* on one end of the edge than on the other, the *Ranker* end would (bearing as then upon a point) in working dig Gutters on the Surface of the *Stuff*; but this *Iron* (being ground to a Convex Arch) though it should be set a little *Ranker* on one end of its edge than on the other, would not make Gutter on the Surface of the *Stuff*, but (at the most but) little hollow dawks on the *Stuff*, and that more or less, according as the *Plain* is ground more or less arching. Nor is it the Office of this *Plain* to smooth the *Stuff*, but only (as I said) to prepare it, that is, to take off the irregular Rifings, whether on the sides or in the middle, and therefore it is set somewhat *Ranker*, that it may take the irregularities the sooner off the *Stuff*, that the *Smoothing Plain* or the *Foyner* may afterwards the easier work it *Try*. The manner of *Trying* shall be taught when I come to Treat of the use of the *Rule*.

You must note, that as I told you in *Smithing*, Numb. I. fol. 14, 15, 16. it was the office of the coarse tooth'd *File* to take off the prominent irregularities the *Hammer* made in the *Forging*, &c. and that you were not to file them more away than you need, so the same Caution is to be given you in the using of this *Fore Plain* in *Joyner*, for the reason there alledged in *Smithing*, whither, to avoid repetition, I refer you; only with this consideration, that there *Iron* or *Steel* was the matter wrought upon, and there a coarse *File* the *Tool*; but now *Wood* is the matter, and a *Course* or *Fore plain* the *Tool*.

§ 3. Of setting the Iron.

When you *set* the *Iron* of the *Fore-Plain*, consider the *Stuff* you are to work upon, viz. whether it be *hard* or *soft*, or *Curling*, as *Joyners* call *Cross-grain'd Stuff*: If it be *hard* or *curling*, you must not *set* the *Iron* very *rank*, because a mans strength will not cut deep into *hard wood*; and if it be not *hard wood*, but *curling* or *knotty*, and the *Iron* *rank set*, you may indeed work with it till you come to some *knot* or *curl*, but then you may either tear your *Stuff*, or break the edge of your *Iron*: therefore you may perceive a reason to *set* the *Iron* *fine* for *curling* and *knotty stuff*.

But if you ask me how *rank* your *Iron* ought to be *set* I answer, If your wood be *soft* and your *Stuff* *free* and *fromy*, that is, evenly temper'd all the way, you may *set* the *Iron* to take a shaving off the thickness of an old coined shilling, but scarce thicker; whereas, if your *Stuff* be *hard*, or *curling*, or *knotty*, you shall scarce be able to take a shaving off the thickness of an old Groat. Therefore you must examine the temper of your *Stuff*, by easy tryals, how the *Plain* will work upon it, and *set* your *Iron* accordingly. And observe this as a General Rule, that the *Iron* of the *fore-Plain*, is for the first working with it to be *set* as *rank* as you can make good work with; and that for speed sake.

If your *Iron* be *set* too *rank*, knock with an *Hammer* upon the *Brutch* of the *Stock*, and afterwards upon the *wedge*, for this knocking upon the *Brutch*, if you knock hard enough will raise the *Iron* a little, and *set* it *fine*; if you knock not hard enough, you must knock again, till the *Iron* do rise, but if you

knock too hard, it will raise the *Iron* so much, that its edge will rise above the *Sole* into the *Mouth* of the *Stock*, and consequently not touch the *Stuff*: therefore you must knock softly at first, till by trials you find the *Iron* rises to a convenient *fineness*. But as this knocking on the *Britch* raises the *Iron*, so it also raises and loosens the *wedge*: therefore (as afore-said) whenever you knock upon the *Britch*, you must also knock upon the *wedge*, to fasten the *Iron* again.

If you have raised the edge of the *Iron* too *fine*, you must knock softly upon the head of the *Iron*, and then again upon the *wedge*, and this you may sometimes do several times, till you fit your *Iron* to a convenient *fineness*.

When you have occasion to take your *Iron* out of the *Stock* to rub it, that is to *whet* it, you may knock pretty smart blows upon the *Stock*, between the *Mouth* and the *Fore-end*, to loosen the *wedge*, and consequently the *Iron*.

These ways of *setting* are used to all other *Plains*, as well as *Fore-plains*.

In the using of this, and indeed all other *Plains*, you must begin at the hinder end of the *Stuff*, the Grain of the wood laying along the length of the *Bench*, and Plain forward till you come to the fore-end, unless the *Stuff* proves *Cross-grain'd*, in any part of its length, for then you must turn your *Stuff* to Plain it the contrary way so far as it runs *Cross-grain'd*. And in Plaining you must at once lean pretty hard upon the *Plain*, and also thrust it very hard forwards, not letting the *Plain* totter to or from you-wards, till you have made a stroak the whole length of the *Stuff*. And this sometimes if your *Stuff* be long, will require your making two or three steps

steps forwards, ere you come to the fore-end of the *Stuff*: But if it do, you must come back, and begin again at the farther end, by the side of the last Plain'd, stroak, and so continue your several lays of Plaining, till the whole upside of the *Stuff* be Plain'd.

And if the *Stuff* be broad you are to Plain upon, and it *warp* a little with the *Grain*, or be any ways crooked in the bredth, you must then turn the *Grain* athwart the *Work-Bench*, and Plain upon the *Cross-Grain*. For, if your work be hollow in the middle, you must Plain both the Bearing sides thinner, till they come to a *Try* with the middle. Then turn the other side of your work, and working still *Cross-grain'd*, work away the middle, till it come *Try* with the two sides.

This way of *Cross-Grain'd* working, is by Workmen called *Traversing*.

Thus have you in general the use of all the other *Plains*: But the use of those *Plains* that are designed for other particular purposes, I shall shew as they come in Order.

§ 4 Of the *Joynter*. B 2.

The *Joynter* is made somewhat longer than the *Fore-plain*, and hath its *Sole* perfectly straight, from end to end. Its office is to follow the *Fore-plain*, and to *shoot* an edge perfectly straight, and not only an edge, but also a Board of any thickness, especially when a *Joynt* is to be *shot*. Therefore the Hand must be carried all along the whole length with an equal bearing weight, and so exactly even and upright to the edges of the Board, that neither side of the *Plain* encline either inward or outwards,
but

but that the whole breadth be exactly square on both its sides; supposing its sides straight: so will two edges of two boards, when thus *shot*, ly so exactly flat and square upon one another, that light will not be discerned betwixt them. But yet it is counted a piece of good workmanship in a *Joyners*, to have the craft of bearing his hand so curiously even, the whole length of a long Board: and yet it is but a sleight to those *Practice* hath inur'd the Hand to. The *Joyners* is also used to *Try* Tables with, (large or small) or other such broad work; and then *Joyners* work as well upon the *Traverse* with it as with the Grain of the wood, and also Angularly or Corner wise; that they may be the more assur'd of the flatness of their work.

Its *Iron* must be set very fine, so fine, that when you wink with one Eye and set that end the straight side of the *Iron* is next to the other Eye, there appear a little above an hairs bredth of the edge above the superficies of the sole of the *Plain*, and the length of the edge must ly perfectly straight with the flat bredth of the sole of the *Plain*. For the *Iron* being then well wedg'd up, and you working with the *Plain* thus set, have the greater assurance, that the *Iron* cannot run too deep into the *Stuff*, and consequently you have the less danger that the *Joyners* is wrought out of straight.

§ 5. The Use of the *Strike-block*.

The *Strike-Block* marked B 3. is a *Plain* shorter than the *Joyners*, having its sole made exactly flat, and straight; and is used for the shooting of a short *Joyners*; because it is more handy than the long *Joyners*. It is also used for the framing and fitting the *Joyners*.

Joynts of *Miters* and *Bevels*; but then it is used in a different manner from other *Plains*: For if the *Miter* and *Bevel* you are to fit be small, you must hold it very steady in your left hand, with the *Sole* of it upwards, and its fore-end towards your right hand: and you must hold your work in your right hand very steady: Then apply the sawn *Miter* or sawn *Bevel* end of your *Stuff*, to the fore-end of the *Strike-Block*, and so thrust it hard and upright forwards, till it pass over the edge of the *Iron*, so shall the edge of the *Iron*, with several of these thrusts continued, cut or plain off your *stuff* the roughness that the *Teeth* of your *Saw* made: But if your work be so big that you cannot well weild it in your right hand, you must set the end of your work in the *Bench-screw*, and Plain upon it with a *smoothing Plain*.

§ 6. *The Use of the Smoothing Plain.*

The *Smoothing Plain* marked B 4. must have its *Iron* set very *fine*, because its Office is to smoothen the work from those Irregularities, the *Fore-Plain* made.

§ 7. *The Use of the Rabbet Plain.*

The *Rabbet-Plain* marked B 5. is to cut part of the upper edge of a Board or other *Stuff* straight, that is, square down into the Board, that the edge of another Board also cut down in the same manner, may fit and joyn into the Square of the first board thus cut away: And when two Boards are thus lapped on the edges over one another, this lapping over is called *Rabbetting*.

The *Rabbet Plain* is also sometimes used to strike

a *Facia* in a peice of *Molding*; as shall be shewed in its proper place.

The *Sides* of the *Iron* are not inclosed in the *Stock* of this *Plain*, as the foregoing *Plains* are, but the *Iron* is full as broad as the *stock* is thick, that the very angles of the edge of the *Iron* may not be born off the *stuff*, to hinder the straight and square cutting it down: nor doth it deliver its shaving at a *Mouth* on the top of the *Stock* as the other *Plains* do: But it hath its *Mouth* on the sides of the *Plain*, and delivers its shavings there. Its *Iron* is commonly about an Inch broad.

§ 8. *The Use of the Plow.*

The *Plow* marked B 6. is a narrow *Rabbit-Plain* with some additions to it: viz. two square *Staves*, marked *a a* (yet some of them have the upper edges of them rounded off for the better compliance with the Hand). These *Staves* are let stiff through two square *Mortesses* in the *stock*, marked *b b*. They are about seven or eight Inches long, and stand straight and square on the farther side of the *stock*; and these two *staves* have sholders on the higher side of the *stock* reaching down to the wooden *sole* of the *Plain* (for there is also an *Iron sole* belonging to the *Plow*). To the bottom of these two Sholders is Rivetted with Iron Rivets a *Fence* (as workmen call it) which comes close under the *Wooden sole*, and its depth reaches below the *Iron sole* about half an Inch: Because the *Iron* of the *Plow* is very narrow, and the sides of it towards the bottom are not to be inclosed in the *stock*, for the same reason that was given in the *Rabbit-plain*, therefore upon the *stock* is let in and strongly nailed an Iron Plate of the thickness of the *Plow Iron*, for wood
of

of that bredth will not be strong enough to endure the force the lower end of the *Plow Iron* is put to : This *Iron Plate* is almost of the same thickness that the bredth of a *Plow Iron* is. Joyners have several *Plows* for several widths of *Grooves*.

The Office of the *Plow* is to *plow* a narrow square *Groove* on the edge of a Board, which is thus perform'd. The Board is set an edge with one end in the *Bench screw*, and its other edge upon a *Pin* or *Pins* put into a *Hole* or *Holes* in the *Leg* or *Legs* of the *Bench*, such an *Hole* or *Holes* as will most conveniently for height fit the bredth of the Board, Then the *Fence* of the *plow* is set to that distance off the *Iron Plate* of the *Plow* that you intend the *Groove* shall ly off the edge of the Board : As if you would have the *Groove* ly half an Inch off the Board, then the two *staves* must with the *Mallet* be knocked through the *Mortesses* in the *stock* till the *Fence* stands half an Inch off the *Iron Plate* : And if the *staves* are fitted stiff enough in the *Mortess* of the *stock*, it will keep at that distance whiles you *Plow* the *Groove* : For the *Fence* (lying lower than the *Iron* of the *Plain*) when you set the *Iron* of the *Plow* upon the edge of the Board, will ly flat against the farther edge of the Board, and so keep the *Iron* of the *Plow* all the length of the Board at the same distance from the edge of the Board that the *Iron* of the *Plow* hath from the *Fence*. Therefore your *Plow* being thus fitted, *Plow* the *Groove* as you work with other *Plains*, only as you layd hold on the *stock* of other *Plains* when you use them, now you must lay hold of the two *staves* and their *sholders*, and so thrust your *Plow* forwards, till your *Groove* be made to your depth.

If the *Staves* go not stiff enough in the *Mortesses* of the *stock*, you must stiffen them by knocking a little wooden wedge between the *staves* and their *Mortesses*.

§ 9. Of Molding Plains.

There are several other *Plains* in use among *Joyners*, called *Molding-plains*; as, the *Round*, the *Hollow*, the *Ogee*, the *Snipes-Bill*, the *Rabbit-plain*, the *Grooving-plain*, &c. And of these they have several sorts, *viz.* from half a quarter of an Inch, to an Inch and a half. They are used as other *Plains* are.

In the *Plaining* of *stuff*, you must use *Plains* whose *Irons* have different *Mountings*; and that according to the hardness or softness of the *Wood* you are to work upon: For if the wood be hard, the *Iron* must stand more upright than it need do if the wood be soft: For soft wood, as *Deal*, *Pear-tree*, *Maple*, &c. The *Iron* is set to make an *Angle* of 45 degrees with the *Sole* of the *Plain*: But if it be very hard wood you are to *Plain* upon, as *Box*, *Ebony*, *Lignum Vita*, &c. It is set to 80 degrees, and sometimes quite upright: so that these hard woods are indeed more properly said to be *Scraped*, than *Plained*.

But before you come to use your *Plains*, you must know how to grind and whet them, for they are not so fitted when they are bought, but every workman accommodates them to his purpose, as if it be an hard wood he is to work on, he grinds his *Basil* to a more obtuse *Angle* than he would do for soft wood.

The *Basil* or *Angle* an *Iron* is ground to, to work on soft wood is about 12 degrees, and for hard wood about

about 18 or 20 degrees. Where note, that the more accute or thinner the *Basil* is the better and smoother the *Iron* cuts, and the more obtuse and thicker, the stronger the edge is to work upon hard work.

§. 10. *Of Grinding and Whetting the Iron, and other Edge-Tools.*

When you grind your *Iron*, place your two thumbs under the *Iron*, and your Fingers of both hands upon the *Iron*, and so clap down your *Iron* to the stone, holding it to that Angle with the *Stone* you intend the *Basil* shall have: keep the *Iron* in this posture without either mounting or sinking its ends all the while the *Stone* is turning about; And when you lift the *Iron* off the *Stone*, to see if it be ground to your mind; if it be not, you must be sure you place the *Iron* again in the same Position on the *Stone* it had before; for else you will make a double *Basil* on your *Iron*: But if it be true set on the *Stone* and stedily kept to that Position your *Basil* will be *Hollow*, and the smaller your *Grindstone* is, the hollower it will be. You may know when it is well Ground, by the evenness and entireness of the edge all the way.

Having ground your *Iron*, you must smoothen the edge finer with a good fine *Whet-stone*. Thus, hold the edge of your *Iron* upwards in your left hand and your *Whet-stone* in your right, and having first spit upon your *Stone* to wet it, apply it to the *Basil* of your *Iron*, in such a Position that it may bear upon the whole breadth of the *Basil*; and so working the *Stone* over the *Basil* you will quickly wear the coarser grating of the *Grind stone* off the

edge on that side: Then turn the flat side of the *Iron*, and apply the *Stone* flat to it, till you have worn off the coarſe gratings of the *Grind ſtone*, on that ſide too.

Joyners often grind their *Irons* upon a flat *Grind-ſtone* alſo: And then they hold the *Iron* alſo in their hands in the ſame poſture as if it were to be ground on the *Round Grindſtone*: yet then inſtead of keeping the *Iron* on one place of the *Stone*, they thruſt it hard ſtraight forwards, almoſt the length of the *Stone*, and draw it lightlier ſtraight back again, keeping it all the while at the ſame Angle with the ſuperficies of the *Stone*, and then ſmoothen its edge with the *Whet-ſtone*, as if it had beed ground upon the round *Grind ſtone*. And this they do ſo often, till they have rubbed the hollowneſs of the *Baſil* to a flat, and then they grind it again upon the round *Grind ſtone*.

This Order and Manner of *Setting*, *Grinding* and *Smoothing* a *Baſil* and *Edge*, is alſo uſed in all other *Edge-Tools* Joyners uſe.

§ 10. Of Chiffels of ſeveral ſorts,
And firſt of Formers.

Formers marked C 1, C 3 are of ſeveral ſizes. They are called *Formers* becauſe they are uſed before the *Paring Chiffel*, even as the *Fore-Plain* is uſed before the *Smoothing-Plain*. The *Stuff* you are to work upon being firſt ſcribed (as I ſhall ſhew in its proper place) you muſt ſet the edge of the *Former*, a little without the ſcribed ſtroak, with its *Baſil* outwards, that it may break and ſhoulder off the *Chips* from your work as the edge cuts it. And you muſt bear the *Helve* of the *Former* a little inwards

wards over the *Stuff*, that the *Former* do not at first cut straight down, but a little outwards: For, should you venter to cut straight down at the first, you might with a negligent or unlukely knock with the *Mallet* drive the edge of the *Former* under the work, and so cut before you are aware more off the under side than the upper side of your work, and so (perchance) spoil it. Therefore you may make several cuttings, to cut it straight down by little and little, till your work is made ready for the *Paring Chissel*. When it is used the *Helve* of it is knockt upon with a *Mallet*, to drive the edge into the *Stuff*.

§ 11. Of the Paring Chissel.

The *Paring Chissel* C 2. must have a very fine and smooth edge: Its office is to follow the *Former*, and to *pare* off and *smoothen* the irregularities the *Former* made.

It is not knockt upon with the *Mallet*, but the Blade is clasped upon the outside of the hindermost joynts of the four and little fingers, by the clutched inside of the middle and third fingers of the right hand, and so its edge being set upon the *scribed line*, and the top of the *Helve* placed against the hollow of the inside of the right sholder, with pressing the sholder hard upon the *Helve*, the edge cuts and pares away the irregularities.

This way of handling may seem a preposterous posture to mannage an Iron Tool in, and yet the reason of the Original contriver of this posture is to be approved; For, should workmen hold the *Blade* of the *Paring Chissel* in their whole hand, they must either hold their hand pretty near the *Helve* where they

they cannot well mannage the *Tool*, or they must hold it pretty neer the edge, where the outside of the fingers will hide the *scribed-line* they are to *Par* in. But this posture all workmen are at first taught, and Practice doth so inure them to it, that if they would they could not well leave it.

§ 12. *Of the Skew-Former.*

The *Skew-Former* marked C 4 is seldom used by Joyners, but for cleansing accute angles, with its accute Angle on its edge, where the *Angles* of other *Chissels* will not so well come.

§ 13. *Of the Mortefs Chissel.*

The *Mortefs Chissel* marked C 5. is a narrow *Chissel* but hath its *Blade* much thicker, and consequently stronger (that it may endure the heavier blows with the *Mallet*) than other *Chissels* have, so that in grinding it to an edge it is ground to a very broad *Basil*, as you may see in the Figure. Its Office is to cut deep square holes called *Morteffes* in a peice of wood. Joyners use them of several Bredths according as the Bredths of their *Morteffes* may require.

§ 14. *Of the Gouge.*

The *Gouge* marked C 6. is a *Chissel* having a round edge, for the cutting such wood as is to be Rounded or Hollowed.

These several sorts of *Chissels* Joyners have of several sizes, that they may be accomodated to do several sizes of work.

MECHANICK EXERCISES,

OR,

The Doctrine of

Handy-works,

*From May the 1. to June the 1.
1678. And is intended to be
Monthly continued.*

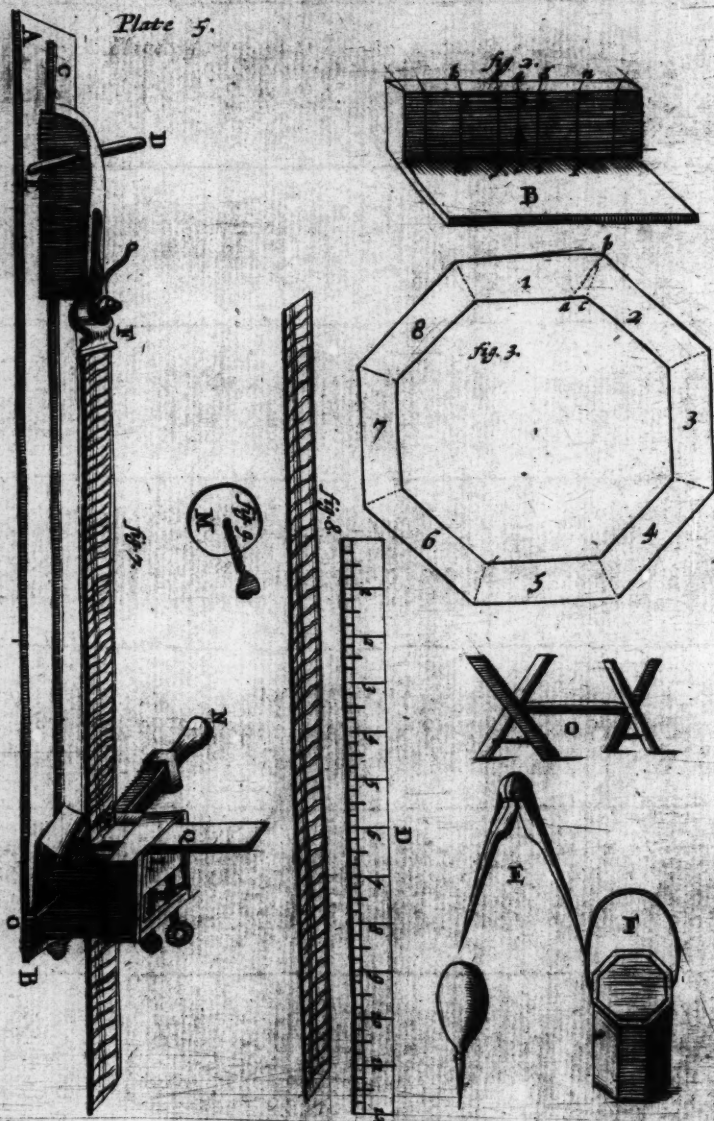
By *Joseph Moxon* Hydrographer to
the King's most Excellent Majesty.



L O N D O N,

Printed for *Joseph Moxon*, at the Sign of *Atlas* on
 Ludgate Hill. 1678.

Plate 5.



MECHANICK EXERCISES.

OR,

The Doctrine of Handy-works.

Continued in the Art of Joynery.

§ 15. *Of the Square, and its Use.*

TH E *Square*, marked D, is two adjunct Sides of a Geometrical Square. *a* The *Handle*, *b* The *Tongue*, *c* The *Outer Square*, *d* The *Inner Square*. For Joyners use it is made of two pieces of wood, the one about an Inch thick and the other about a quarter of an Inch thick: These two pieces are severally shot exactly straight, and have each of their Sides parallel to each of their own Sides. The thick Piece (called the Handle) hath a Mortise in it, as long within a quarter of an Inch as the thin piece (called the Tongue) is broad, and stiffy so wide as to contain the thickness of the Tongue. The Tongue is fastned into the Mortise of the Handle with Glew and wooden Pins, so as the two outer sides (and then consequently the two inner sides) may stand at right angles with one another.

The Reason why the Handle is so much thicker than the Tongue, is because the Handle should on either side become a Fence to the Tongue. And the reason why the Tongue hath not its whole breadth let into the end of the Handle is, because they may with less care strike a line by the side of

N

a thin

a thin than a thick piece : For if instead of holding the hand upright when they strike a line, they should hold it never so little inwards, the shank of a Pricker falling against the top edge of the Handle would throw the Point of a Pricker farther out than a thin piece would: to avoid which Inconvenience the Tongue is left about half an Inch out of end of the Handle.

Another Reason is, That if with often striking the Pricker against the Tongue it becomes ragged, or uneven, they can with less trouble plain it again when the stuff is all the way of an equal strength, than they can if cross-grain shoulders be added to any part of it.

Its use is for the striking of lines square either to other lines or to straight sides, and to try the squareness of their work by; As if they would strike a line square to a side they have already shot; They apply the inside of the Handle close to the side shot, and lay the Tongue flat upon the work, then by the outerside of the Tongue they draw with a Pricker a straight line. This is called *Striking or drawing of a Square*. Or, if they would Try the squareness of a Piece of stuff shot on two adjoining sides, they apply the insides of the Handle and Tongue to the outersides of the stuff, and if the outersides of the stuff do all the way agree in line with the insides of the Square, It is true Square. Or if they would try the inward squareness of work, they apply the two outersides of the Square to the insides of the work.

§ 16. *The manner of Plaining and Trying a piece of Stuff square.*

We will take for Example, a Piece of Stuff called

led a Quarter, which is commonly two Inches thick, four Inches broad, and seven Foot long. To plain this square, Lay one of its broad sides upon the Bench, with one of its ends shov'd pretty hard into the Teeth of the Bench-hook, that it may ly the fteddier. Then with the Fore-Plain as you were taught §2. *Numb. 4.* Plain off the roughness the Saw made at the Pit, and work that side of the Quarter as straight in its length and breadth as you can with the Fore-Plain, which you may give a pretty good guess at, if the edge of the Iron have born all the way upon the work, yet you may try by taking up your work, and applying one end of it to one Ey while you wink with the other, and observe if any Hollow or Dawks be in the length; if not, you may conclude it pretty true: For the work thus held, the Ey will discern pretty nearly. Or, for more certainty you may apply the edge of the two Foot Rule, or rather a Rule shot the full length of the Quarter to your work, and if it agree all the way with the Rule, you may conclude it is straight in length. But if you finde it not straight, you must still with the Fore Plain work off those Risings that bear the edge of the Rule off any part of the Stuff: Then try if the Breadth be pretty straight, if it be (the Dawks the roughness the Fore Plain made excepted) the first office of the Fore Plain is perform'd: If it be not, you must straighten the Breadth as you did the Length.

But though this Quarter be thus plained straight in length and breadth, yet because the Iron of the Fore Plain for its first working the stuff is set Rank, and therefore makes great Dawks in the stuff, you must set the Iron of your Fore plain finer, as you were

taught § 3. *Numb. 4.* and with it then work down even almost to the bottom of those Dawks : then try it again, as before, and if you find it Try all the way, you may with the Joynter or Smoothing Plain, but rather with the Joynter, go over it again, to work out the irregularities of the fine Fore Plain : For the Iron of the Fore Plain being ground to a Rising in the middle, as has been shewed § 2. *Numb. 4.* though it be very fine set, will yet leave some dawks in the Stuff for the Joynter or Smoothing Plain to work out. Thus the first side of the Quarter will be finished.

Having thus Tried one side of the Quarter straight and flat, Apply the in-side of the Handle to it, and if one of the adjoining sides of the Quarter comply also with the in-side of the Tongue all the way, you need only smooth that adjoining side : But if it do not so comply, that is, if it be not square to the first side, which you will know by the riding of the in-side of the Tongue upon one of the edges, or some other part between the edges, you must with the Fore Plain Rank-set plain away that stuff which bears off the inside of the Tongue from complying all the way with it. But if the risings be great, you may for quickness hew away the Risings with the Hatcher : but then you must have a care you let not the edge of your Hatcher cut too deep into the stuff, lest you either spoil your stuff by making it unsizeable, if it be already small enough, or if it have substance enough, make your self more labour to get out those Hatcher stroaks with the Plain than you need. Then take off the roughness the Hatcher made with the Fore Plain Rank-set, then fine set, and last of all with the Joynter

ter or smoothing Plain : so is the second side also finished.

To work the third side, set the Oval of the Gage exactly to that width from the Gage that you intend the Breadth of the Quarter (when wrought) shall have, which in this our Example is four Inches, but will be somewhat less, because working it true will diminish the stuff : Therefore sliding the Oval on the Staff, measure on your Inch Rule so much less than four Inches as you think your stuff diminishes in working : Measure, I say, between the Oval and the Tooth, your size, If at the first proffer your Oval stand too far from the Tooth, Hold the Oval in your hand and knock the Tooth end of your staff upon the work Bench till it stand near enough : If the Oval stand too near knock the other end of the Staff upon the Work-Bench till it be fit. Then apply the flat of the Oval to the second wrought side of your Stuff, so as the Tooth may reach athwart the breadth of the stuff upon the first side, and keeping the Oval close against the second side, press the Tooth so hard down that by drawing the Gage in this Posture all along the length of the Quarter, the Tooth may strike a line. In like manner upon the side opposite to the first, viz. the fourth side, Gage another line opposite to the first gaged line, and work your stuff down to those two Gaged lines on the third side, either with Plaining alone, or with Hewing and afterwards Plaining, as you were taught to work the second side.

To Work the fourth side set the Tooth of the Gage to its exact distance from the Oval, viz. two Inches wanting so much as you think the stuff di-

minisht in working, and apply the flat of the Oval to each side of the first side, and Gage as before two lines, one on the second, the other on the third wrought side. Work your stuff then down on the fourth side to these two Gage lines, either with Plaining alone, or with Hewing and afterwards Plaining, as you were taught to work the second side.

§ 17. *To Frame two Quarters Square, into one another.*

You must take care in Mortessing and Tennanting, that as near as you can you equallize the strength of the sides of the Mortess to the strength of the Tennant. I do not mean that the stuff should be of an equal Substance, for that is not equallizing strength: But the equallizing strength must be considered with respect to the Quality, Position and Substance of the Stuff. As if you were to make a Tennant upon a piece of Fur, and a Mortess to receive it in a piece of Oak, and the Fur and Oak have both the same size. The Tennant therefore made upon this piece of Fur must be considerably bigger than a Tennant need be made of Oak, because Fur is much a weaker wood than Oak, and therefore ought to have a greater Substance to equallize the strength of Oak. And for Position, the shorter the stuff that the Tennant is made on, the less Violence the Tennant is subject to. Besides it is easier to split wood with the grain, than to break wood cross the grain; and therefore the same wood when posited as a Tennant is stronger than the same wood of the same size when posited as a Mortess: for the injury a Mortess is subject to is splitting with the grain of the wood, which without good care it will often do

do in working: but the force that must injure a Tennant must offend it cross the grain of the wood, in which position it will best indure violence.

When two pieces of wood of the same quality and substance (as in this our Example) are elected to make on the one a Tennant, and in the other a Mortefs. If you make the Mortefs too wide, the sides of the Mortefs will be weaker than the Tennant; or, if too narrow, the Tennant that must fit the Mortefs will be weaker than the sides that contain the Mortefs: And if one be weaker than the other the weakest will give way to the strongest when an equal violence is offer'd to both. Therefore you may see a necessity of equallizing the strength of one to the other, as near as you can. But because no Rule is extant to do it by, nor can (for many considerations I think) be made, therefore this equallizing of strength must be referred to the Judgment of the Operator. Now to the work.

The Mortefs to be made is in a Quarter four Inches broad. In this case workmen make the Mortefs an Inch wide, so that an Inch and an half stuff remains on either side it. Therefore your stuff being squar'd as was taught in the last Section, Set the Oval of the Gage an Inch and an half off the Tooth, and gage with it on either side your stuff a straight line at that distance from the end you intend the Mortefs shall be: then open your Compasses to two Inches, and prick off that distance in one of the lines, for the length of the Mortefs: then lay the inside the Handle of the Square to one side of the stuff, and upon both the pricks successively, and with your Pricker draw straight lines through them by the side of the Tongue, so shall the bounds of your Mortefs be struck

struck out on the Quarter. If your Mortefs go through the Quarter, draw the same lines on the opposite side of the Quarter, thus, Turn the Quarter or its edge, and apply the inside of the Handle of the Square to the ends of the former drawn lines, and by the side of the Tongue draw two lines on the edge of the Quarter, then turn the Quarter again with its other broad side upwards, and apply the inside of the Handle of the Square to the ends of the last lines drawn on the edge, and by the side of the Tongue draw two lines on this broad side also. These two lines (if your quarter was truly squar'd) shall be exactly opposite to the two lines drawn on the first broad side of the quarter, for the length of the Mortefs: And for the width of the Mortefs Gage this side also, as you did the first: then for the Tennant, Gage on that end of the Quarter you intend the Tennant shall be made, the same lines you did for the Mortefs. And because the Quarter is two Inches thick, prick from the end two Inches, and applying the inside of the Handle of the Square to the side of the Quarter, and the Tongue to that Prick, draw by the side of the Tongue a line through that side the Quarter: then turn the other sides of the Quarter successively, and draw lines athwart each side the Quarter, as you were taught to draw the opposite lines for the Mortefs.

Then place the edge of the Inch Mortefs Chissel with its Basil from you, and the Helve bearing a little towards you, within one half quarter of an Inch of one end of the struck Mortefs, and with your Mallet knock hard upon it, till you find the Basil of the Chissel will no longer force the chips out of the Mortefs: then remove the Chissel to the other end

of

of the Mortefs, and work as with the first end, till the Chips will void no longer: Then work away the Stuff between the two Ends, and begin again at one of the ends, and then at the other, and work deeper into the Mortefs; then again between both; and so work deeper by degrees, till you have wrought the Mortefs through, or (if not through) to the intended depth: then with the Mortefs Chissel work neater the drawn lines at the ends of the Mortefs (for before you were directed to work but within half a quarter of an Inch of the drawn lines,) by laying light blows on it, till you have made it fit to pare smooth with a narrow Paring Chissel, and then pare the ends, as you were taught to work with the Paring Chissel: then with the broad Paring Chissel, pare the sides of the Mortefs just to the struck lines; so is the Mortefs finished.

To work the Tennant lay the other Quarter on edge upon your Work Bench, and fasten it with the Holdfast, as you were taught Sect. I. Then with the Tennant Saw Saw a little without the struck line towards the end: you must not Saw just upon the struck line, because the Saw cuts rough: Besides, you must leave some stuff to pare away smooth to the struck line, that the *Stile* (that is, the upright Quarter) may make a close Joyn with the *Rail* (that is) the lower Quarter: Saw therefore right down with the Tennant Saw, just a mozt to the gaged lines for the thickness of the Tennant, and have a care to keep the Blade of the Saw exactly upright. Then turn the opposite side of the Quarter upwards, and work as you were taught to work the first side.

Then with the paring Chissel, pare the work close

close to the gaged lines for the Tennant. Then try how it fits the Mortels: If it be not pared enough away, you must Pare it where it Bears, that is, sticks. But if you should chance to have made it too little, you have spoiled your work: Therefore you may see how necessary it is not to make the Mortels too wide at first, or the Tennant too narrow.

Then with the Piercer pierce two holes through the sides or cheeks of the Mortels, about half an Inch off either end one. Then knock the Tennant stiff into the Mortels, and set it upright by applying the angle of the outer square to the angle the two Quarters make, and with your Pricker prick round about the insides of the Pierced holes upon the Tennant. Then take the Tennant out again, and Pierce two holes with the same Bit about the thickness of a shilling above the Pricked holes on the Tennant, that is, nearer the sholder of the Tennant, that the Pins you are to drive in may draw the sholder of the Tennant the closer to the flat side of the Quarter the Mortels is made in. Then with the Paring Chissel make two Pins somewhat Tapering, full big enough, and setting the two Quarters again square as before, Drive the Pins stiff into the Pierced holes.

If you make another Square as you did this, and make also a Tennant on each un-Tennanted end of the Stiles, and another Mortels on the top and bottom Rails, you may put them together and make square Frame of them.

§ 18. *Of the Miter Square. And its Use.*

The Miter Square marked B hath (as the Square) an Handle marked a one Inch thick, and three Inch-

es broad, and a Tongue marked *b* of about the same breadth: the Handle and the Tongue (as the Square) have both their sides parallel to their own sides. The Handle (as the square) hath in the middle of its narrowest side a Mortise in it; of an equal depth the whole length of the Handle: Into this Mortise is fitted one end of the Tongue, but the end of the Handle is first Bereld off to make an Angle of 45 Degrees with its inside. This Tongue is (as the square) Pind and Glewed into the Mortise of the Handle.

It is used for striking a Miter line, as the Square is to strike a square line, By applying the Inside of the Handle to the outside of the Quarter or Batten, you are to work upon: and then by striking a line by the side of the Tongue: For that line shall be a Miter line. And if upon two Battens you strike two such lines, and Saw and Pare them just off in the lines, when the flats of those two sawn ends are applied to one another, the out and inside of the Battens will form themselves into the Figure of a Square.

Thus Picture Frames and looking Glass-frames are commonly made, as by a more full Example you may see in the next Section.

§ 19. Of the Bevil.

As the Square is made to strike an Angle of 90 Degrees, and the Miter an Angle of 45 degrees, so the Bevil (marked *F*) having its Tongue movable upon a Center may be set to strike angles of any greater or lesser numbers of Degrees, according as you open the Tongue wider from, or shut it closer to the Handle. It is used as the Square, and the Miter, and will perform the Offices of them both, though it be not purposely made for either; but for

the striking such Bevil lines as one part of your work must be cut away to, to make it joyn with another part of your work: for Example.

We will propose to make a Frame for a Picture, Locking Glass, &c. containing eight straight sides, You may quickly perceive that all the ends of these eight sides must be cut to Bevils, and what Bevils they must be, you will find if you describe upon a smooth flat Board a Circle of any bigness, but the larger the better: Devide this Circle into eight equal parts, and from every point draw a line to the Center: Draw also straight lines from every point to its next point: Then lay the Inside of the Handle of your Bevil exactly upon any one of these straight lines, so as the angle made by the inside of the Handle and the inside of the Tongue lye exactly at the very angle made by this straight line, and the Semi-Diametral line proceeding from the Center, and move the Tongue nearer or farther off the Handle till the inside of the Tongue and the inside of the Handle ly exactly upon those two lines, So shall your Bevil be set.

Then having fitted your Peeces to your Scantling, Stick your Pricker as neer the outward Corner of your Peeces as your stuff will bear, and apply the inside of your handle also to the outer sides of your Pieces, and so as the inside of the Tongue may be drawn home to the Pricker. For then lines drawn on those Peeces by the inside of the Tongue shall be the lines the Pieces must be cut in to make these eight Pieces joyn evenly together by the sides of each others Bevil: then with the Strike-block smooth the ends of the Bevils, as you were taught in the Section of the Strike-Block.

If you have a Board on the Back-side of this Frame

Frame, you may Glew the backsides of these Peeces Peece by Peece to the Board ; but first you must fit them to an exact compliyanse of every Bevil with its Match, and when they are so fitted, drive two Nails close to the outside of every Peece, but drive not the Nails deep into the Board, because when the Frame is set and Glewed, or otherwise fastned, you must draw the Nails out again, For these Nails are only intended to serve for Fences to set and fit each peece into its proper place, before the whole Frame is fastned together. And should you not thus Fence them, though by your Eye you might judge you fitted the Bevils exactly, yet one Peece being never so little out of its due position would drive the next peece more out, and that the next, till at the last, the last Peece would not joyn, but either be too short, or too long, or stand too much out, or in, or else too open, or too close on the out or inside.

But if you have no Board on the backside, you must when you Saw the Bevelling angles upon the square ends of Pieces not sawn quite through the depth of one end of every peece, but about half way through the depth or thickness, and then with your Chissel either split or else pare the upper side of the square end flat away to the Bevil, and so leave part of the square end of your piece to lap under the peece is joyned to. For Example.

In fig. 3 Plate 5. *a b* is the square end of the peece, and *b c* is the Bevil you work the Peece to. Therefore you must work away so much of the thickness of the square end as is comprehended between *a* and *c*, so that you will see the Triangle *abc* is to be wrought away half way down the thickness

of the stuff, and so will the Triangle *abc* be left for the other half thickness of the stuff. But that end of the piece mark'd 1, which joyns to the Peece mark'd 2, must upon its Bevil stroak be sawn quite off; and its underside must have the same Triangle wrought into it, just so fit as to receive the Triangle in Peece 2, and just so deep as that when the Triangle on Peece 2 is fitted into the Triangle in Peece 1 the Superficies of both the Peeces may be even with one another. And thus you may lap the ends of every Peece into one another.

These Triangles at the ends of the Peeces you may Glew into one another, but if you think Glewing alone not strong enough, you may Pierce an hole neer the inner edge of the Frame, because the Triangle hath there most substance of stuff; and afterwards Pin it, as you are taught to Pin the Rail and Stile together in Sect. 17.

This way of Lapping over is sometimes used also for square Miters, or other Angular Frames.

§. 20. *Of the Miter Box.*

There is another way used by Joiners that make many Frames to save themselves the labour of Drawing or striking out of Squares, Miters, and several Bevils upon their stuff: And this is with a Tool called a *Miter Box*, described in Plate 5, fig. 2. It is composed of two Peeces of Wood, of an Inch thick each, as A the upright Peece, B the Bottom Piece. The Upright piece is nailed upright, fast upon the Bottom Piece. And this Upright Peece hath on its upper side the Miter Lines struck with the Miter square, as *d e*, on the left hand, and *g h* on the right hand: on these two Miter lines the edge of

of the Saw is set, and a kerf made straight down the upright peece, as from *de* on the left hand to *f*, and from *g h* on the right hand to *i*. In like manner any other Bevil is struck upon the upper side of the upright peece with the Bevil, as *k l* on the left hand, and *n o* on the right. On these two Bevil lines the edge of the Saw is set, and a kerf made straight down the upright peece, as from *k* to *l m*, and from *g h* to *i*. You may make as many Bevils as you please on the upright peece, of the Miter Box; Bevils to joyn Frames of either five, six, seven, eight sides &c. and the manner to make them to any number of sides was in part taught in the last Section. For as there you were directed to divide the Circle into eight equal parts, because eight was the number of sides, we proposed to make that Frame consist of; So, if for any number of sides you divide the Circle into the same equal parts, and work as you were there directed, you may find what Bevil the Peeces must have that make a Frame that consists of any number of sides.

So also for Sawing of any Batten, or other small pieces square, Strike at the point *a* on the upper side of the upright Peece a line straight athwart it, to *b*, and Saw straight down the upper peece, to *c*.

The manner how these kerfs are Sawed straight down with greatest certainty is, thus, Apply the inside of the Handle of the square to the upper side of the upright piece, so as the Tongue lye close to that end of the Miter, Bevil, or square line struck through the upper side of the Miter Box, and with the Picker strike a line close by the side of the Tongue through that side of the upright Peece; Turn the Tongue to the other side the upright Peece.

Peece and apply the inside of the Handle of the square to the other end of the Miter, Bevil, or square line, and with the Pricker strike also a line close by the side of the Tongue through that side the upright Peece. These two lines struck on either side of the upright peece shall be a line on each side in which the edge of the Saw must run, to saw it straight down.

§ 21. Of the Gage.

The *Gage* mark'd *G* (in *Plate 4*) The *Oval* *b* is fitted stiff upon the *Staff* *c*, that it may be set nearer or farther from the *Tooth* *a*. Its Office is to *Gage* a line parallel to any straight side. It is used for *Gaging* Tennants, and for *Gaging* Stuff to an equal thickness.

When you use it, you must set the *Oval* to the intended Distance from the *Tooth*: If the *Oval* stand too near the *Tooth*, Hold the *Oval* in your right hand, and knock the hinder end of the *Staff* upon the work bench, till it remove to its just distance from the *Tooth*: If it stand too farr off the *Tooth*, knock the fore end of the *Staff* (viz. the *Tooth* end) till it remove to its just distance from the *Tooth*: If the *Oval* slide not stiff enough upon the *Staff*, you may stiffen it by striking a wooden wedge between the *Mortels* and the *Staff*: So may you apply the side of the *Oval* next the *Tooth*, to the side of any Table or any other straight side, with the *Tooth* *Gage* a line parallel (or of equal distance) all the way from that side.

§ 22 Of the Piercer.

The *Piercer* *H* in *Plate 4* hath *a* the *Head*, *b* the *Pad*,
c the

of the *Stock*, & the *Bit*. Its office is so well known, that I need say little to it. Only, you must take care to keep the *Bit* straight to the *Hole* you pierce, least you deform the *Hole*, or break the *Bit*.

You ought to be provided with *Bits* of several sizes, fitted into so many *Padds*.

§ 23. Of the *Gimblet*.

The *Gimblet* is marked I, in *Plate 4*. It hath a *Worm* at the end of its *Bit*. Its Office is to make a round hole in those places of your work where the *Stock* of the *Piercer* by reason of its own *sholder*, or a *sholder* of *Butting* out upon the work will not turn about. Its *Handle* is held in a clutched hand, and its *Bit* twisted stiff into your work. You must have them of several sizes.

§ 24. Of the *Augre*.

The *Augre* marked K in *Plate 4*, hath a *Handle*, & the *Bit*. Its Office is to make great round holes. When you use it, the stuff you work upon is commonly laid low under you, that you may the easier use your strength upon it: For in twisting the *Bit* about by the force of both your hands, on each end of the *Handle* one, it cuts great chips out of the stuff. You must bear your strength perpendicularly straight to the end of the *Bit*, as with the *Piercer*.

§ 25. Of the *Hatcher*.

The *Hatcher* is marked L, in *Plate 4*. Its use is so well known (even to the most un-intelligent) that I need not use many words on it, yet thus much I will say, Its use is to Hew the irregularities off

such

such peeces of stuff which may be Tooner Hewn than Sawn.

When the Edge is downwards and the Handle towards you, the right side of its Edge must be Ground to a Bevil, so as to make an Angle of about 12 degrees with the left side of it: and afterwards set with the whetstone, as the Irons of Plains, &c.

§ 26. *The Use of the Saw in general.*

In my former *Exercises* I did not teach you how to chuse the Tools a Smith was to use, Because it is a Smiths office to make them: And because in those *Exercises* I treated of making Iron work, and Steel work in general, and the making and excellency of some Tools in particular, which might serve as a general notion for the knowledge of all Smiths Workmanship, especially to those that should concern themselves with Smithing: But to those that shall concern themselves with Joynery, and not with Smithing; It will be necessary that I teach them how to chuse their Tools that are made by Smiths, that they may use them with more ease and delight, and make both quicker and neater work with them.

All sorts of Saws for Joyners use are to be sold in most Iron-monger shops, but especially in *Foster-lane, London*: chuse those that are made of Steel, (for some are made of Iron) for Steel is of it self is harder and stronger than Iron: You may know the Steel Saws from Iron Saws, Thus, The Steel Saws are generally ground bright and smooth, and are (the thickness of the Blade considered) stronger than Iron Saws: But the Iron Saws are only Hammer-hardened, and therefore if they could be so hard, yet they

they cannot be so smooth as if the irregularities of the Hammer were well taken off with the Grind-stone : see it be free from flaws, and very well Hammered, and smoothly Ground, (that is evenly Ground,) you may know if it be well Hammered by the stiff bending of it, and if it be well Ground, (that is evenly Ground,) it will not bend in one part of it more than in another; for if it do, it is a sign that part where it bends most is either too much Ground away, or too thin Forged in that place: But if it bend into a regular bow all the way, and be stiff, the Blade is good: It cannot be too stiff, because they are but Hammer hardened, and therefore often bow when they fall under unskillful hands, but never break, unless they have been often bowed in that place. The edge whereon the Teeth are is always made thicker than the back, because the back follows the Edge, and if the Edge should not make a pretty wide kerf, if the back do not stick in the kerf, yet by never so little irregular bearing or twisting of the hand awry, it might so stop as to bow the Saw; and (as I said before) with often bowing it will break at last. When workmen light of a good Blade thus qualified, they matter not much whether the Teeth be sharp or deep, or set to their mind; for to make them so is a task they take to themselves, And thus they perform it! They wedge the blade of the Saw hard into the Whetting Block, marked P, in *Plate 4*, with the handle towards their left hand, and the end of the Saw to the right, then with a three square file they begin at the left hand end, bearing harder upon the side of the file on the right hand than on the side to the left hand; so that they file the upper side of the Tooth of the Saw aslope towards the right hand,

and the underside of the Tooth a little aslope towards the left, or almost down-right. Having filed one Tooth thus, all the rest must be so filed. Then with the *Saw Wress*, marked Q in *Plate 4.* they set the Teeth of the Saw: that is, they put one of the Notches marked *a a* of the *Wress* between the first two Teeth on the Blade of the Saw, and then turn the Handle Horizontally a little about upon the Notch towards the end of the Saw, and that at once turns the first Tooth somewhat towards you, and the second Tooth from you: Then skipping two Teeth, they again put one of the notches of the *Wress* between the third and fourth Tooth on the Blade of the Saw, and then (as before) turn the Handle a little about upon the notch towards the end of the Saw, and that turns the third Tooth somewhat towards you, and the Fourth somewhat from you: Thus you must skip two Teeth at a time, and turn the *Wress* till all the Teeth of the Saw are set. This *Setting* of the Teeth of the Saw (as workmen call it) is to make the kerf wide enough for the Back to follow the edge: and is *Set Ranker* for soft, coarse, cheap stuff than for hard, fine, and costly stuff: for the *Ranker* the Tooth is set, the more stuff is wasted in the kerf: and besides, if the stuff be hard it will require greater labour to tear away a great deal of hard stuff, than it will do to tear away but a little of the same stuff.

The *Pit-Saw*, is set so Rank for coarse stuff as to make a kerf of almost a quarter of an Inch, but for fine and costly stuff they set it finer to save stuff, The *Whip-Saw* is set somewhat finer than the *Pit-Saw*, the *Hand-Saw*, and the *Compass-Saw*, finer than the *Whip-Saw*; But the *Tennant Saw*, *Frame-saw*, and the *Bow Saw*, &c. are set fine and have

have their Teeth but very little turned over the sides of their Blades : So that a kerf made by them is seldom above half a half quarter of an Inch.

The reason why the Teeth are filed to an angle, pointing towards the end of the *Saw*, and not towards the handle of the *Saw*, or directly straight between the handle and end of the *Saw*, is, Because the *Saw* is designed to cut only in its progress forwards; Man having in that activity more strength to rid, and Command of his hands to guide his Work, than he can have in drawing back his *Saw*, and therefore when he draws back his *Saw*, the Work-man bears it lightly off the unsawn *Stuff*, which is an ease to his labour, and enables him the longer to continue his several Progressions of the *Saw*.

Master-Workmen when they direct any of their Underlins to saw such a piece of Stuff, have several phrases for the sawing of it: They seldom say *Saw that piece of Stuff*; But *Draw the Saw through it*; *Give that piece of Stuff a kerf*; *Lay a kerf in that piece of Stuff*; and sometimes, (but most improperly,) *Cut*, or *Slit that piece of Stuff*: For the *Saw* cannot properly be said to cut or slit the *Stuff*; but it rather breaks or tears away such parts of the *Stuff* from the whole, as the points of the Teeth prick into, and these parts it so tears away are proportionable to the fineness or rankness of the Setting of the Teeth.

The Excellency of Sawing is to keep the kerf exactly in the line marked out to be Sawn, without wriggling on either or both sides; And straight through the *Stuff*, as Work-men call it; that is, in a Geometrical term perpendicularly through the upper and underside, if your work require it, as most

most work does : But if your work be to be Sawn upon a Bevel, as some work sometimes is, then you are to observe that Bevel all the length of the Stuff, &c.

§ 27. *The Use of the Pit-Saw, marked M in Plate 4.*

The *Pit-Saw* is not only used by those Work-men that make Sawing Timber and Boards their whole business, but is also for small matters used by Joiners, when what they have to do, may perhaps be as soon done at home, as they can carry or send it to the Sawyers. The manner of their working is both alike, for if it be a Board they would slit off a peece of Timber, or if they would take any square, Quarter, or Batten, &c. off, they first set off their Scantlin : For Example, If it be an Inch (or more or less) they would take off a peece of Stuff, they open the points of their Compasses to an Inch measure on their Rule, and so much more as they reckon the kerf of the *Saw* will make, and from one side of their Stuff they set off at either end, of the Stuff the Distance of the points of their Compasses ; at this Distance therefore they make with the points of their Compasses a prick at either end of the Stuff ; Then with Chaulk they whiten a line, by rubbing the Chaulk pretty hard upon it ; Then one holds the line at one end upon the prick made there, and the other strains the line pretty stiff upon the prick at the other end ; then whiles the line is thus strain'd, one of them between his Finger and Thumb draws the middle of the line directly upright, to a convenient height (that it may spring hard enough down) and then lets it go again, so that it swiftly applies to its first position

tion, and strikes so strongly against the Stuff that the dust or atoms of the Chaulk that were rubbed into the Line, shake out of it, and remain upon the Stuff. And thus also they mark the under-side of their Stuff: This is called *Lining of the Stuff*: And the Stuff cut into those lines shall be called *Inch-Stuff*, because the Compasses that prickt the Stuff were opened wider by the width of the kerf than an Inch measure upon the Rule: But had the Compasses been opened but to an Inch exactly, that peece Sawnd off should in Workmens Language have been called *Inch prickt*, thereby giving to understand that it is half the breadth of the kerf thinner than an Inch: And thus they call all other Scantlins *2 Inches, 2½ Inches, 3 Inches, &c. Sawnd, or Prickt.*

When two Work-men are not at hand to hold the line at both ends, he that lines it strikes one point of his Compass, or sometimes a Pricker, or a Nail aslope towards that end into the prick set off, and putting the noose at the end of his line over his Compasses, &c. goes to the other end, and strains his line on that prick, and strikes it as before.

The Stuff being thus lined is fastned with wedges over the *Pit*, (if the Joyner be accommodated with a *Pit*) if he have none, he makes shift with two high frames a little more than Man high in its stead, (called *great Trussels*) with four Legs, these Legs stand spreading outwards, that they may stand the firmer: Over these two *Trussels* the Stuff is laid and firmly fastned that it shake not. Its outer side from whence the Pricks were set off must be Perpendicular, which you must try by a Plumb line, for should the top edge of that side, hang never so little over the bottom edge, or the bottom edge
not

not ly so far out as the top edge, the Scantlin you Saw off would not be of an equal thickness on the Top or Bottom; Because the Saw is to work exactly perpendicular. Then with the *Pit-Saw* they enter the one end of the Stuff, the *Top-man* at the Top, and the *Pit-man* under him; the *Top-man* observing to guide the *Saw* exactly in the line; and withal drawing the *Saw* somewhat towards him when the *Saw* goes down; and the *Pit-man* drawing it with all his strength perpendicularly down; but not so low that the upper and lower handles of the *Saw* sink below both their managements: Then bearing the Teeth of the *Saw* a little off the Stuff, the *Top-man* draws the *Saw* up again, and the *Pit-man* assists or eases him in it, and thus they continue sawing on till the *Saw* has run through the whole length upon the Stuff. But when the kerf is made so long that by the working of the *Saw* the Peeeces of Stuff on either side will shake against one another, and so more or less hinder the easie progress of the *Saw*, they drive a Wedge so far in the kerf as they dare do for fear of splitting the Stuff, and so provide the *Saw* a freer and easier passage through the Stuff: This wedging they continue so oft as they find occasion.

MECHANICK
EXERCISES,

O R,

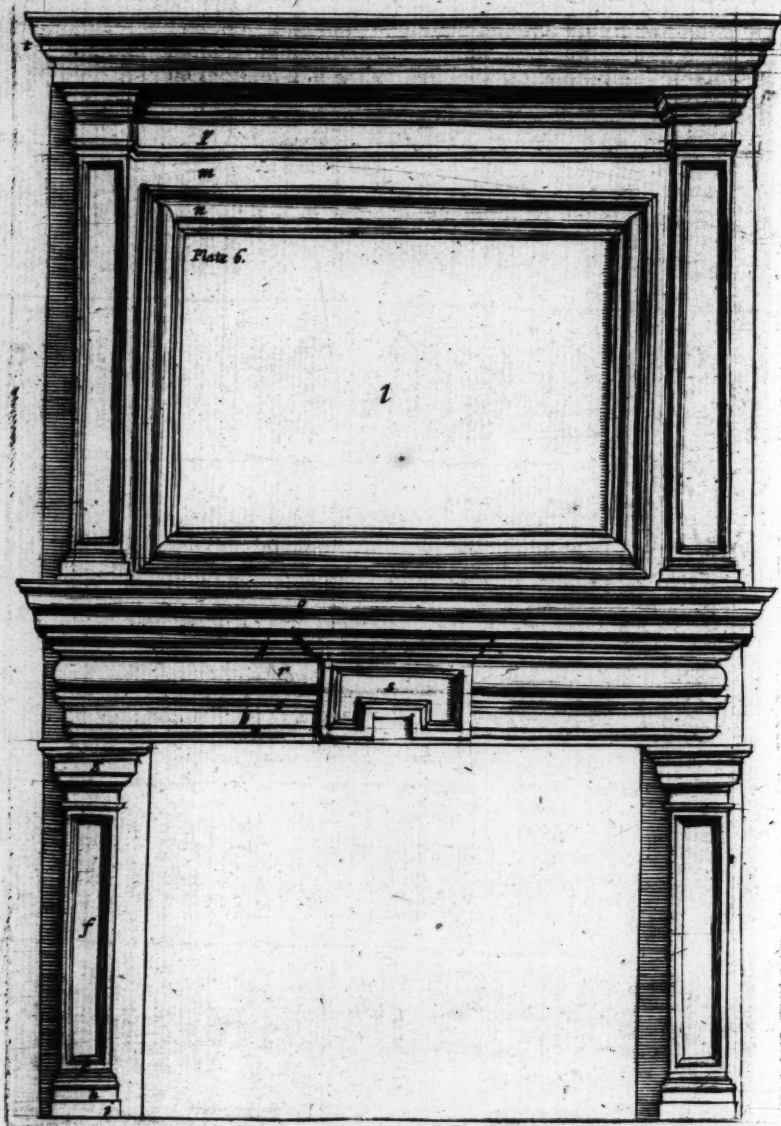
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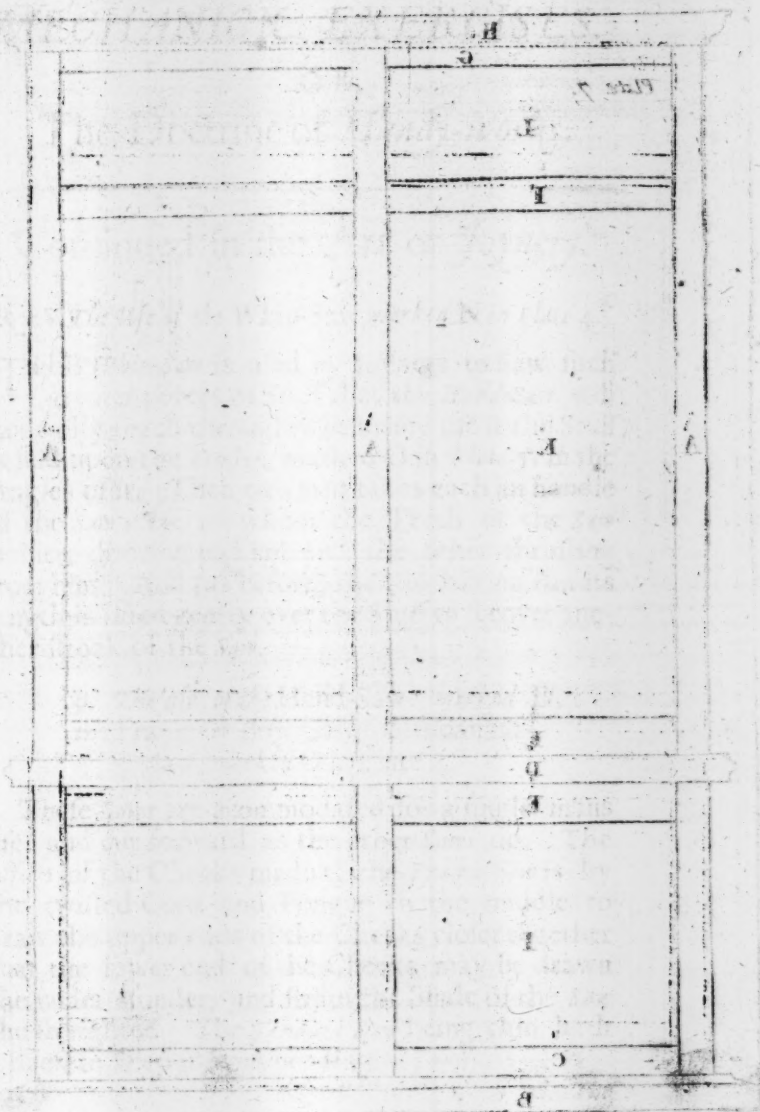
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1678. And is intended to be
Monthly continued.*

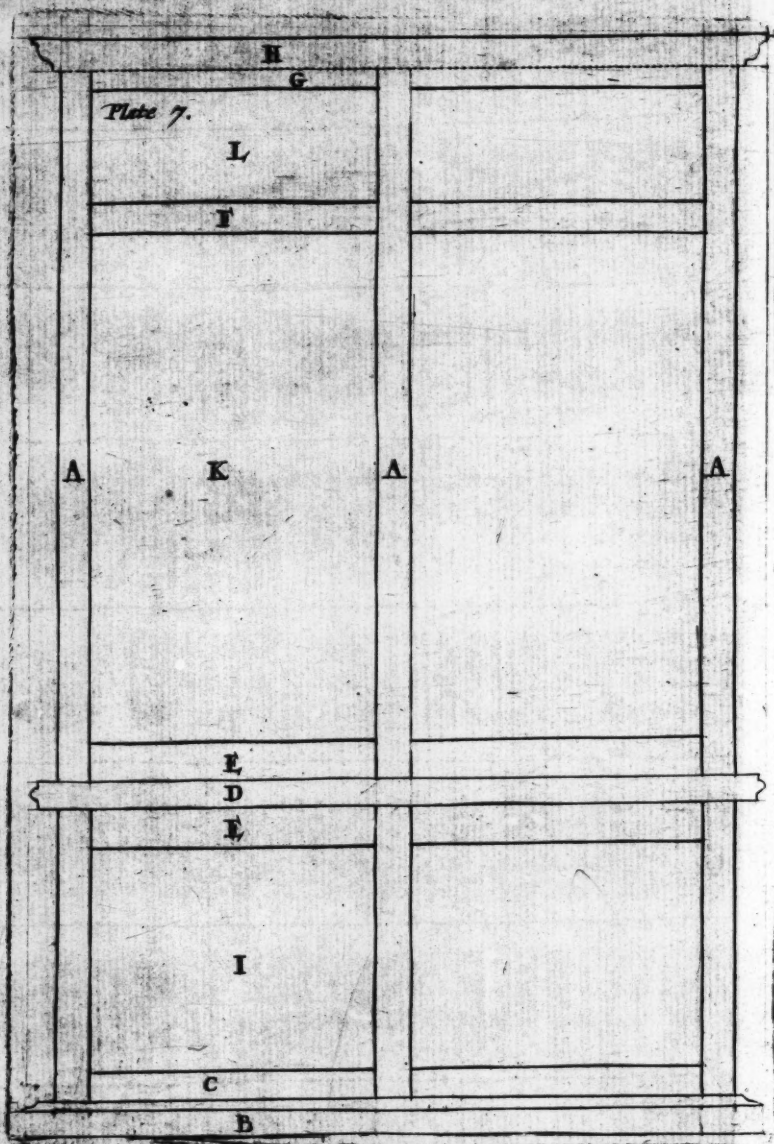
By *Joseph Moxon* Hydrographer to
the King's most Excellent Majesty.



L O N D O N,
Printed for *Joseph Moxon*, at the Sign of *Atlas* on
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MECHANICK EXERCISES.

O R,
The Doctrine of *Handy-works*.

Continued in the Art of *Joynery*.

§ 28. *The Use of the Whip-Saw, marked N in Plate 4.*

THE *Whip-Saw* is used by Joyners to Saw such greater peeces of Stuff that the *Hand-Saw* will not easily reach through; when they use it the Stuff is laid upon the *Trussel*, marked O in *Plate 5*. in the Angles of it. Then two men takes each an handle of the *Saw*; He to whom the Teeth of the *Saw* points, drawing to him, and the other thrusting from him: And (as before) the *Saw* having run its length, is lifted gently over the Stuff to recover another stroak of the *Saw*.

29. *The use of the Hand-Saw, marked D, the Frame or Bow Saw, the Tennant-Saw, marked O in Plate 4.*

These *Saws* are accomodated for a single mans use, and cut forward as the other *Saws* do. The office of the Cheeks made to the *Frame-Saw* is by the twisted Cord and Tongue in the middle to draw the upper ends of the Cheeks closer together that the lower end of the Cheeks may be drawn the wider asunder, and strain the Blade of the *Saw* the straighter. The *Tennant Saw* being thin hath a Back to keep it from bending.

Q

§ 30. The

§ 30. *The Use of the Compass-Saw, marked Q Plate 4.*

The *Compass-Saw* should not have its Teeth *Set*, as other *Saws* have; but the edge of it should be made so broad, and the back so thin, that it may easily follow the broad edge, without having its Teeth *Set*; for if the Teeth be *Set*, the blade must be thin, or else the Teeth will not bow over the Blade, and if it be thin, (considering the Blade is so narrow) it will not be strong enough to abide tough work, but at never so little an irregular thrust, will bow, and at last break; yet for cheapness, they are many times made so thin that the Teeth require a setting. Its office is to cut a round, or any other Compass kerf; and therefore the edge must be made broad, and the back thin, that the Back may have a wide kerf to turn in.

§ *Of the Rule marked D in Plate 5.*

The use of the *Rule* is to measure Feet, Inches, and parts of Inches, which for that Purpose are marked upon the flat and smooth sides of the *Rule*, and numbred with Inches, and hath every Inch divided into two halves, and every half into two quarters, and every quarter into two half quarters; so that every Inch is divided into eight equal parts. And these Inches are numbred from one end of the *Rule* to the other, which commonly is in all 24 Inches: which is a Two Feet *Rule*.

They have commonly both Board and Timber measure, &c. marked upon them, for the finding both the superficial and solid Content of Board or Timber: The use of which Lines and Tables having been often taught by others, and being more

Ma-

Mathematical than Mechanical, is unproper for me to meddle with in this Place: but rather to refer to those Books.

But the manual use of it is, either to measure length with it, or to draw a straight line by the side of it, or to Try the straightness or flatness of their Work with. They Try their work by applying one of its edges to the flat of the wrought side of their Work, and bring their Eye as close as they can, to see if they can see light between the edge of the *Rule* and their Work: If they cannot they conclude their work is *Try*, and well wrought.

§ 32. Of the Compasses marked E in Plate 3.

aa The *Joynt*, *bb* the *Checks* of the Joynt, *cc* the *shanks*, *dd* the *Points*. Their Office is to describe Circles, and set off Distances from their Rule, or any other measure, to their Work.

§ 33. Of the Glew-pot marked F in Plate 3.

The *Glew-pot* is commonly made of good thick Lead, that by its substance it may retain a heat the longer, that the Glew *Chill* not (as Work-men say when it cools) when it is to be used.

§ 34. Of Chusing and Boyling Glew.

The clearest, dryest and most transparent Glew is the best: when you boyl it, break it with your Hammer into small peeces, and put it into a clean Skillet or Pipkin, by no means greasie, for that will spoil the clamminess of the Glew, put to it so much Water as is convenient to dissolve the Glew, and to make it when it is hot about the thickness of the white of an Egg: the quantity of water can-

not be assigned, because of the different quality there is in Glew : keep it stirring while it is melting, and let it it not stick to the sides or bottom of the Vessel : When it is well boyled, pour it into your Glew-pot to use, but let your Glew-pot be very clean. When it is cold, and you would heat it again in your Glew-pot, you must take great care that it burn not to the sides or bottom of the Glew-pot, for that burning either turns to a thick hard skin, or else to a burnt Cinder-like Substance, which if it mingle with the Glew will spoil it all ; because by its Substance it will bear the two Joynts you are to Glew together, off each other.

When (with often heating) the Glew grows too thick, you may put more water to it ; but then you must make it very hot, lest the Glew and water do not wholly incorporate.

Some Joyners will (when their Glew is too thick) put Small Beer into it thinking it strengthens it : I have tryed it, and could never find it so, but think it rather makes the Glew weaker, especially if the Small Beer chance to be new, and its Yest not well settled from it, or so stale that it be either Dreggy, or any whit mingled with the settlings of the Cask.

§ 35. *Of using the Glew.*

Your Glew must be very warm, for then it is thinnest, and as it chills it thickens : with a small Brush you must smear the Glew well upon the Joynt of each peece you are to Glew together ; And before you set them as they are to stand, you must joine them one upon the other, that the Glew may well touch and take hold of the Wood ; and that

that the Glew on each Joynt may well incorporate. Then fit the two Joynts as they must stand ; And when you set them by to dry, let the one stand upright upon the other ; For if they stand aslope, the weigh of the Stuff when it leans upon two extreme edges, may make one end of the Joynt *Open*.

§ 36. *Of the Waving Engine.*

The *Waving Engine* described in *Plate 5. Fig. 7.* Hath A B a long square Plank, of about seven Inches broad, five Foot long, and an Inch and half thick : All along the length of this Planck on the middle between the two sides runs a *Rabbit*, as part of it is seen at C : upon this *Rabbit* rides a *Block* with a *Groove* in its under side : This Block is about three Inches square and ten Inches long, having neer the hinder end of it a wooden Handle going through it, of about one Inch Diameter, as D E : At the Fore-end of this Block is fastned a Vice, somewhat larger than a great Hand-Vice, as at F : The *Groove* in the Block is made fit to receive the *Rabbit* on the Planck.

At the farther end of the Plank is erected a square strong peece of Wood, about six Inches high, and five Inches square, as G. This Square Peece hath a square wide Mortels in it on the Top, as at H. upon the top of this square peece is a strong square flat Iron Coller, somewhat loosely fitted on, having two Male screws fitted into two Female. Screws, to screw against that part of the Wooden Peece un-mortessed at the Top, marked L, that it may draw the Iron Coller hard against the Iron marked Q and keep it stiff against the fore-side of the un-mortessed Peece, marked L, when the peece
Q is.

Q is set to its convenient heighth; and on the other side the square wooden Peece is fitted another Iron screw having to the end of its shank fastned a round Iron Plate which lies within the hollow of this wooden Peece, and therefore cannot in Draft be seen in its proper place; But I have described it, a part, as at M (fig. 9.) Its Nut is placed at M on the wooden Peece. On the farther side of the Wooden Peece is fitted a Wooden screw called a *Knob*, as at N. Through the farther and hither side of the square Wooden Peece is fitted a flat Peece of Iron, about three quarters of an Inch Broad, and one quarter of an Inch thick, standing on edge upon the Planck; but its upper edge is filed round: (the reason you will find by and by:) Its hither end comes through the wooden Peece, as at O, and its farther end on the opposite side of the wooden Peece.

Upright in the hollow square of the wooden peece stands an *Iron*, as at Q, whose lower end is cut into the form of the Molding you intend your work shall have.

In the fore side of this wooden Peece is a square hole, as at R, called the *Mouth*.

To this Engine belongs a thin flat peece of Hard wood, about an Inch and a quarter broad, and as long as the Rabbet: It is disjunct from the Engine, and in fig. 8. is marked S S, called the *Rack*. It hath its under flat cut into those fashioned waves you intend your work shall have: The hollow of these waves are made to comply with the round edge of flat Plate of Iron marked O (described before) for when one end of the Riglet you wave, is with the Vice Screwed to the plain side of the Rack, and the other end put through the Mouth

Mouth of the wooden Peece, as at T T, so as the hollow of the wave on the under-side of the Rack may ly upon the round edge of the flat Iron Plate set on edge as at O, and the Iron Q is strong fitted down upon the Riglet, Then if you lay hold of the Handles of the Block D E, and strongly draw by them, the Rack and the Riglet will both together slide through the Mouth of the wooden Peece: And as the Rounds of the Rack ride over the round edge of the flat Iron, the Rack and Riglet will mount up to the Iron Q, and as the Rounds of the Waves on the under side of the Rack slides off the Iron on edge, the Rack and Riglet will sink, and so in a progression (or more) the Riglet will on its upper side receive the form of the several waves on the under side of the Rack, and also the form or Molding that is on the edge of the bottom of the Iron, and so at once the Riglet will be both Molded and waved.

But before you draw the Rack through the Engine you must consider the office of the Knob N, and the office of the Iron Screw M, For by them the Rack is screwed evenly under the Iron Q. And you must be careful that the Groove of the Block slip not off the Rabbet on the Planck: For by these Screws and the Rabbet and Groove your work will be evenly gaged all the way (as I said before) under the edge of the Iron Q, and keep it from sliding either to the right or left hand, as you draw it through the Engine.

§ 37. Of Wainscoting Rooms.

AAA (in Plate 7.) The Stiles. B The Base,
C The Lower Rail. D The Sur-Base. E E The
Mid-

Middle Rail (or *Rails*) F The *Frieze-Rail*. G The *Upper-Rail*. H The *Cornice*. I The *Lying Pannel*. K The *Large Pannel*. L The *Frieze Pannel*.

In Wainscoting of Rooms there is, for the most part, but two heights of Pannels used; unless the Room to be Wainscoted be above ten foot high, as some are eleven or twelve foot High, and then three Heights of Pannels are used: As I The *Lying Pannel*, above the *Base*. K The *Large Pannel* above the *Middle Rail*: And L The *Frieze Pannel* above the *Frieze Rail*.

The *Frieze Rail* is to have the same breadth the *Margent* of the *Stile* hath; The *Middle Rail* hath commonly two breadths of the *Margent* of the *Stile*, viz. one breadth above the *Sur-base*, and the other below the *Sur-base*. And the *Upper* and *Lower Rails* have also each the same breadth with the *Margent* of the *Stile*.

Those Moldings above the Prickt line on the Top, as H, are called the *Cornice*.

Sometimes (and especially in Low Rooms) there is no *Base* or *Sur-base* used, and then the *Middle* and *Lower-Rail* need not be so broad: For the *Middle Rail* need not be above a third part more than the *Margent* of the *Rail*: and the *Lower-Rail* you may make of what breadth you see convenient: They are commonly about three Inches and an half, or four Inches broad, yet this is no Rule: For sometimes Workmen make only a flat Plinth serve.

You may (if you will) adorn the outer edges of the *Stiles* and *Rails* with a small *Molding*: And you may (if you will) Bevil away the outer edges of the *Pannels* and leave a Table in the middle of the Pane l.

An Explanation of Terms used among Joiners.

When I first began to Print these Exercises, I marked some Terms in *Joinery* with *superiour Letters* (as Printers call them) thus a b c &c. intending at the latter end of these Exercises to have explained the Terms those Letters referr'd to; But upon consideration that those Terms might often be used in this Discourse, when the Superiour Letter was out of sight, and perhaps its position (where) forgotten; I have changed my mind, and left out the Superiour Letters beyond fol. 66. and instead of those References give you this Alphabetical Table of Terms, by which you may always more readily find the Explanation though you often meet with the Term.

A.

Architrave. See Plate 6. l. is the *Architrave Molding*.

Augre § 24. Plate 4. fig. K.

B.

Base. See Plate 6. h. And Plate 7. B.

Bead. See Plate 6. a.

Bed-molding. See Plate 6. d.

Basil. The Basil is an angle the edge of a Tool is ground away to. See fol. 71.

Batten. Is a Scantling of stuff either two, three or four Inches Broad: and is seldom above an Inch thick: and the length unlimitted.

Beak. The end of the Hold-fast. See fol. 60, 61.

Bench-Screw. See Plate 4. A g. and fol. 60.

Bevil. Any sloping angle that is not a square, is called a Bevil. See fol. 60, 85. § 19. and Plate 4. F.

Bitt. See § 22.

Bow-saw. Plate 4. O.

R

C

C

Capital. See Plate 6. g.

Cast. Stuff is said to Cast or warp when by its own droughth or moisture or the droughth or moisture of the Air or other accident it alters its flatness and straightness.

Clamp. When a Peece of Board is fitted with the Grain to the end of another peece of Board cross the Grain the first Board is *Clamp's*. Thus the ends of Tables are commonly *Clamp't* to preserve them from warping.

Compass saw. See fol. 9. and Plate 4. fig. R.

Cornice. See Plate 6. g. and Plate 7. H.

Cross-grained stuff. Stuff is Cross-grained when a Bough or some Branch shoots out on that part of the Trunck of the Tree; For the Bough or branch shooting forwards, the Grain of that branch shoots forwards also, and so runs a gross the Grain of the Trunck; and if they be well grown together, it will scarce be perceived in some stuff, but in working; yet in Deal Boards, those Boughs, or branches are Knots, and easily Perceiv'd, and if it grew up young with the Trunk, then instead of a Knot you will find a Curling in the Stuff when it is wrought.

Curling-stuff. If the Bough or Branch that shoots out of the Trunk of a Tree be large, and the stuff in that place sawn somewhat aslope; when that stuff comes under the Plain you will find a Turning about or Curling on that place upon the stuff; and in a straight progress of the Plain the Iron will cut *with*, and suddenly *a-cross* the Grain, and that more or less as the Bough grew in the youth of the Tree, or grew more or less upright, or
else

else sloping to the Trunk, or was sawn so. Such Stuff therefore is called *Curling-stuff*.

D.

Door-case. Is the Fram'd work about the Door.

Double-Screw. See fol. 60. Plate 4. fig. g. on the work-bench A.

F.

Facia. See Plate 6. b.

Fence. See § 8. Use of the Plow, and Pl. 4. fig. B 6.

Fine set. The Irons of Plains are set Fine, or Rince. They are set fine, when they stand so shallow below the sole of the Plain that in working they take off a thin shaving. See § 3.

Flat Frieze. See Plate 6. p.

Fore-Plain. See § 2. and Plate 4 B 1.

Former. See § 10. and Plate 4. C 1. C 3.

Frame. See fol. 59, 60.

Frame Saw. See § 28. and Plate 4 O.

Free stuff. See § 3.

Frieze. See Plate 6. p.

Frieze Panel. See Plate 7. L.

Frieze Rail. See Plate 7. F.

Fromy stuff. See § 3.

Gage. See § 11. and Plate 4. G.

Gimbles. See § 23. and Plate 4 I.

Gouge. See § 14. C 6.

Groove. See fol. 60.

Hammer-hard. See Numb. III. fol. 58.

Handle. See § 15. and Plate 4. D 4.

Hard stuff. See § 3.

Hatchet. See § 25. Plate 4 L.

Head. See § 22. Plate 4 H 4.

Hold-fast. See § 1. Plate 4. A d.

Hook. See § 1 Plate 4. A b.

Husk. See Plate 6. n.

R 2

I

Inner-square. See § 15. and Plate 4. D d.

Joynt. See fol 59.

Joyntier. See § 4. and Plate 4. B 2.

Iron. See § 2. and Plate 4. B 1 d.

K.

Kerf. The Sawn-away slit between two peeces of stuff, is called a kerf: See fol. 95.

Knob. See § 36. fol. 104. and Plate 5. fig. 7. N.

Knot. See Plate 6. o.

L.

Large Pannel. See Plate 7. K.

Lying Pannel. See Plate 7. I.

Lower Rail. See Plate 7. H.

M.

Margent. See Plate 7. at AAA the flat bredth of the Stiles besides the Moldings is called the Margent of the Stiles.

Middle Rail. See Plate 7 E B.

Miter. See fol. 60.

Miter Box. See § 20. and Plate 5. fig. 1.

Miter Square. See § 18. and Plate 4. E.

Moldings. The severall wrought-work made with Plains on wood, is called *Moldings*. See Plate 6.

Molding Plains. See § 19.

Mortess. Is a square hole cut in a peeces of stuff, to entertain a Tennant fit to it. See § 17.

Mortess Chissel. See § 13. and Plate 4. C 5.

Mouth. See § 12. B 1. & The Mouth.

Ogee. See Plate 6. c.

Oval. See § 21. and Plate 4. G 6.

Outer Square. See § 15. and Plate 4. D 2.

Pad. See § 22. and Plate 4. H 6.

Pan-

Pannel. In Plate 7. I K L are Pannels, but distinguished by their positions.

Pare. The smooth cutting with the Paring Chiffel is called *Paring*.

Paring Chiffel. See § 11. and Plate 4. C 2.

Pilaster. See Plate 6. f.

Pirrer, See § 22. and Plate 4. H.

Pit-man. The Sawyer that works in the Pit, is called the Pit-man,

Pit-Saw. The Pit-Saw is a great Saw fitted into a square Frame ; as in Plate 4. M is a Pit-Saw.

Planchier. In Pl. 6 between *d* and *e* is the Planchier.

Plinh. See Plate 6.

Plow. See § 8. and Plate 4. B 6.

Pricker. Is vulgarly called an Awl : yet for Joyners use it hath most commonly a square blade, which enters the Wood better than a round Blade will ; because the square angles in turning it about, breaks the Grain and so the Wood is in less danger of splitting.

Rabbet. See § 7.

Rabbet Plain. See § 7. and Plate 4. B 5.

Rack. See Plate 5. Fig. 8. Read § 36.

Rail. See Plate 7. AAA.

Ranck. The Iron of a Plain is said to be *set Ranck*, when its edge stands so far below the Sole of the Plain, that in working it will take off a thick shaving. See § 3.

Ranck-set, See Ranck.

Range. The side of any work that runs straight, without breaking into angles, is said to *run Range* : Thus the Rails and Pannels of one straight side of Wainscoting is said to *run Range*.

Re-

Return. The side that falls away from the Fore-side of any Straight or Range-work, is called the *Return*.

Riglet. Is a flat thin square peece of Wood: Thus the peeces that are intended to make the Frames for small Pictures, &c. before they are Molded are called *Riglets*.

Sub. See fol. 64.

S.

Saw-wrest. See § 26 fol. 94. and Plate 4 O.

Scanilin. The size that your Stuff is intended to be cut to.

Scribe. When Joyners are to fit a side of a peece of Stuff against the side of some other peece of Stuff, and the side of the peece of Stuff they are to fit to is not regular; To make these two peeces of Stuff joyn close together all the way, they Scribe it, (as they phrase it,) thus; They lay the peece of Stuff they intend to Scribe close against the other peece of Stuff they intend to Scribe to, and open their Compasses to the widest distance, these two peeces of Stuff bear off each other: Then (the Compasses moving stiff in their Joynt) they bear the point of one of the shanks against the side they intend to Scribe to, and with the point of the other shank they draw a line upon the Stuff to be Scribed; and then the points of the Compasses remaining unmov'd, and your hand carried evenly along by the side of the peece to be Scribed to, that line scribed upon the peece intended to be Scribed shall be parallel to the irregular side intended to be Scribed to: And if you work away your Stuff exactly to that line, when these two peeces are put together, they shall seem a Joynt.

Shoot a Feynt. See fol. 59.

Skew-

Skew-former. See § 12. and Plate 4. C 4.

Smoothing Plain. See § 6. and Plate 4. B 4.

Sole. See Plate 4. B 7. *bab.* The under-side of a Plain is called the *Sole*.

Square. See § 15. and Plate 4. D.

Staff. See § 21. and Plate 4. G c.

Staves. See § 8. and Plate 4. B 6. *aa.*

Stile. The upright Peecees AA in Pl. 7. are *Stiles*.

Stock. See § 22. and Plate 4. H c.

Stops. In Plate 6 *kk* are *Stops*.

Stuff. The Wood that Joyners work upon they call in general *Stuff*.

Sur-base. In Plate 7. D is the *Sur-base*.

Swelling-Frieze. In Plate 6. *r* is the *Swelling-frieze*.

T.

Table. In Plate 6. *f* is the *Table*.

Taper. All sorts of Stuff or work that are smaller at one end than at the other, and diminish gradually from the biggest end, is said to be *Taper*.

Tennant. Is a square end fitted into a Mortise. See § 17.

Tennant Saw. In Plate 4. O would be a *Tennant Saw*, were the flat of the Blade turned where the edge there stands.

Tongue. See § 16. and Plate 4. D b.

Tooth. See § 21. and Plate 4. G a.

Top-man. Of the two Sawyers, the uppermost is called the *Top-man*.

Tote. See § 2. and Plate 4. B 1 a.

Traverse. See fol. 65.

Trussel. See fol. 97. and Plate 5. Fig. 3.

Try. See § 31.

V.

Vaws-Cornice. See Plate 6. *e.*

Upper Cornice. See Plate 6. *s.*

W.

Warp. The same that Cast is.

Waving Engine. See § 36. and Plate 3.

Wedge. See § 2. and Plate 4. B 1. c.

Whetting-Block. See Plate 4. P.

Whip-Saw. See Plate 4. N.

Wrest. See § 26. and Plate 4. Q.

Thus much of Joynery. The next Exercises will (God willing) be of Carpentry.

Advertisement.

THere is invented by the Right Honorable the Earl of Castlemain, a new kind of Globe, call'd (for distinction sake) the English Globe; being a fix'd and immoveable one, performing what the Ordinary ones do, and much more, even without their usual Appendancies; as Wooden Horizons, Brazen Meridians, Vertical Circles, Horary Circles, &c. For it composes it self to the use and Position of the World, without the Mariners Compass, or the like forreign Help; and besides other useful and surprizing Operations (relating both to the Sun and Moon, and performed by the Shade alone) we have by it not only the constant proportion of Perpendiculars to their Shades, with several Corollaries thence arising, but also an easie, new, and most compendious way of describing Dyals on all Planes, as well Geometrically, as Mechanically: most of which may be taught any one in few Hours, though never so unacquainted with Mathematicks.

To this is added on the Pedestal a Projection of all the appearing Constellations in this Horizon, with their Figures and Shapes. And besides, several new things in it differing from the common Astrolabe, (tending to a clearer and quicker way of Operating) the very Principles of all Steriographical Projections are laid down; and Mathematically demonstrated; as is every thing else of Moment throughout the whole Treatise.

These Globes will be made, and expos'd to Sale about August next, (God willing :) against which time the Book for its use will also be Printed, and sold by Joseph Moxon, on Ludgate-Hill, at the Sign of *Atlas*.

Numb. VII.

MECHANICK EXERCISES.

O R,

The Doctrine of

Handy-works.

Applied to the Art of House-Carpentry.

By *Joseph Moxon*, a Member of
the Royal Society, and Hydrographer
to the King's most Excellent Majesty.



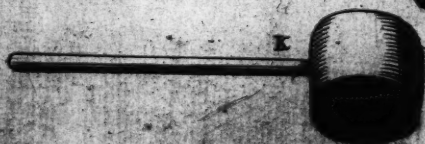
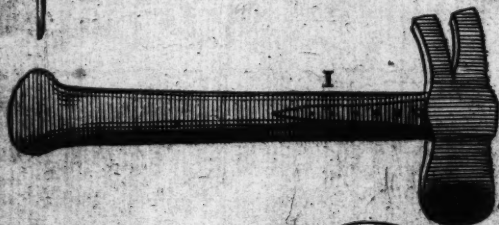
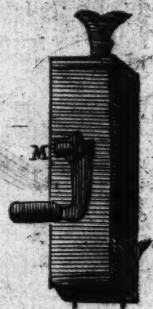
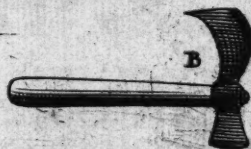
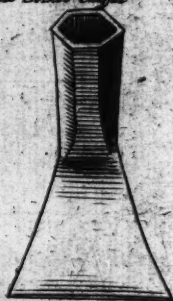
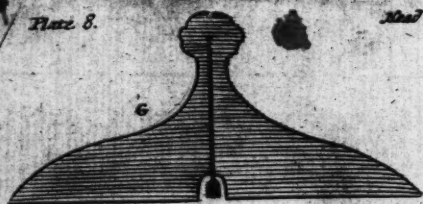
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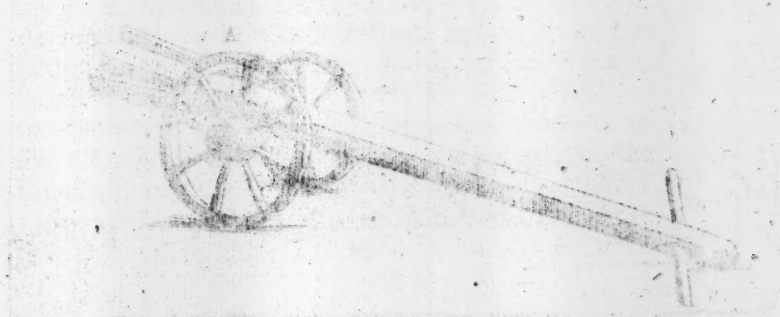
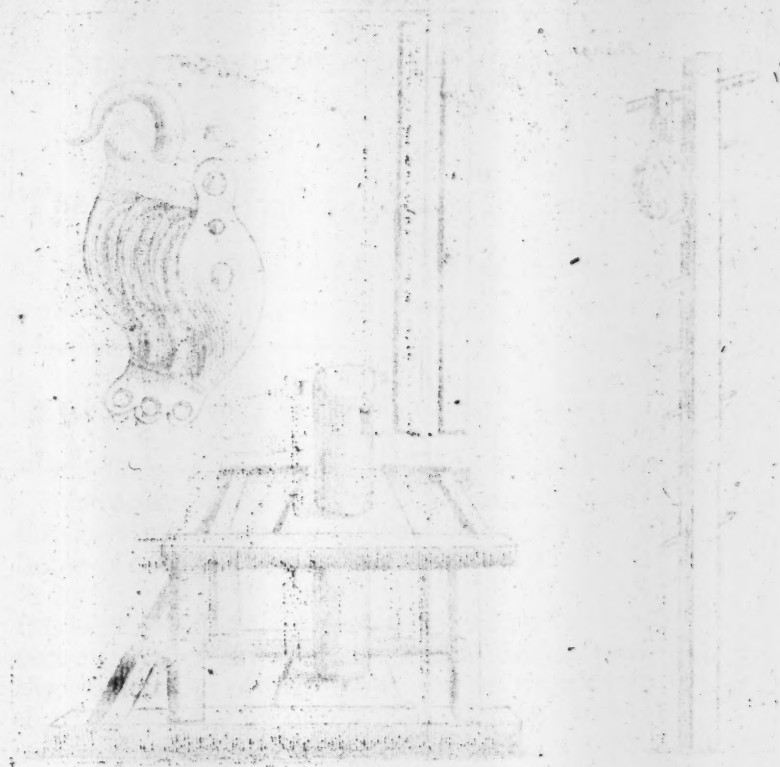
Printed for *Joseph Moxon*, at the Sign of the *Atlas*
on *Ludgate Hill*. 1679.

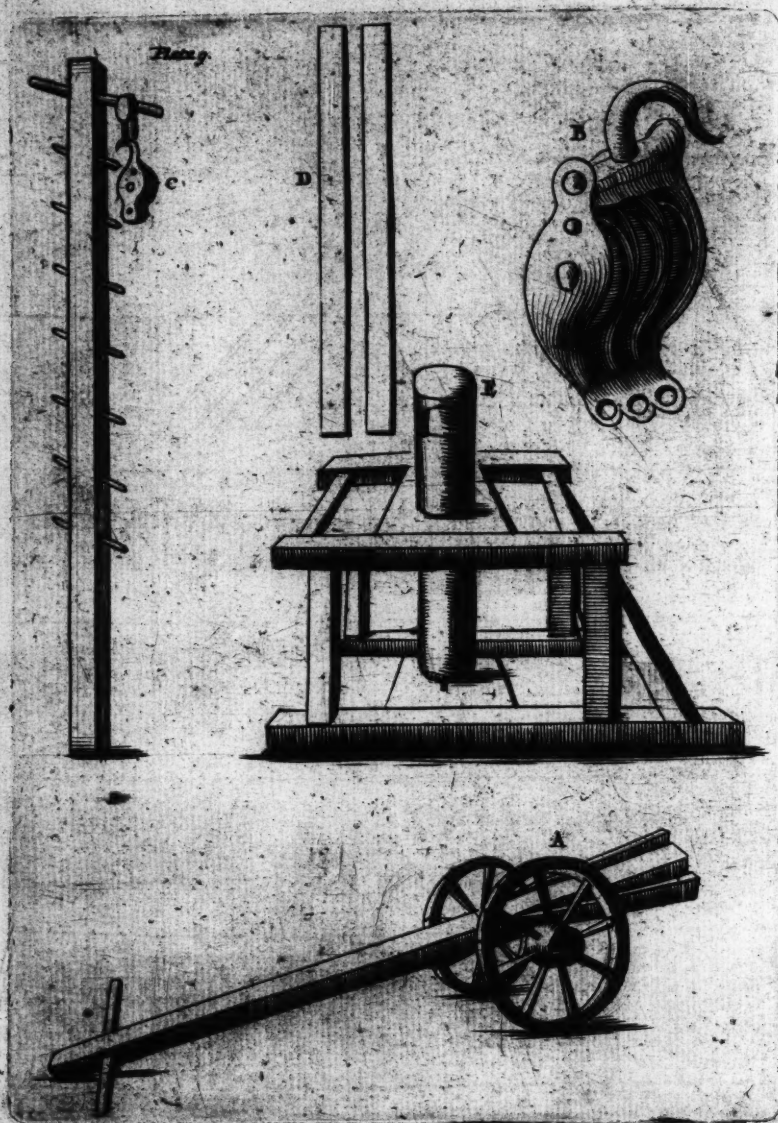
Plate 8.

Head of

the Socket Chisel







MECHANICK EXERCISES,

O R,

The Doctrine of *Handy-works* : appli-
ed to the Art of *House-Carpentry*.

BEing now come to exercise upon the *Carpenters* Trade, it may be expected by some that I should insist upon *Architecture*, it being so absolutely necessary for Builders to be acquainted with: But my Answer to them is, that there are so many Books of *Architecture* extant, and in them the Rules so well, so copiously, and so completely handled, that it is needless for me to say any thing of that Science: Nor do I think any man that should, can do more than collect out of their Books, and perhaps deliver their meanings in his own words. Besides, *Architecture* is a Mathematical Science, and therefore different from my present undertakings, which are (as by my Title) *Mechanick Exercises*: yet because Books of *Architecture* are as necessary for a Builder to understand as the use of Tools; and lest some Builders should not know how to enquire for them, I shall at the later end of *Carpentry* give you the Names of some Authors, especially such as are printed in the English Tongue.

Some may perhaps also think it had been more proper for me in these Exercises to have introduced

S

Car-

Carpentry before *Joynery*, because Necessity (the Mother of Invention) did doubtless compel our Forefathers in the beginning to use the conveniency of the first, rather than the extravagancy of the last. I confess, I considered it my self, and had in my own reason been persuaded to it, but that I also considered, that the Rules they both work by are upon the matter the same, in *Sawing, Mortessing, Tenanting, Scribing, Paring, Plaining, Moulding, &c.* and likewise the Tools they work with the same, though some of them somewhat stronger for Carpenters use than they need be for Joyners; because Joyners work more curiously, and observe the Rules more exactly than Carpenters need do. And therefore I say it was, that I began with Joyners before Carpentry; for he that knows how to work curiously, may when he hits work slightly; whereas they that are taught to work more roughly, do with greater difficulty perform more curious and nice work. Thus we see Joyners work their Tables exactly flat and smooth, and shoot their Joynts so true, that the whole Table shews all one piece: But the Floors Carpenters lay, are also by the Rule of Carpentry to be laid flat and true, and shall yet be well enough laid, though not so exactly flat and smooth as a Table.

Yet though the Rules Joyners and Carpenters work by are so near the same, and the Tools they work with, and Stuff they work upon, the same; yet there are many Requisites proper to a Carpenter, (especially a Master Carpenter) that a Joyner need take little notice of, which after I have described the Carpenters Tools that are not express among the Joyners, I shall speak to.

being 1. Of several Tools used in Carpentry, that are not used in Joynery. And first of the Ax.

THe *Ax* marked *A* in *Plate 8.* is (as you see) different from what the Joyners Hatchet is, both in size and form; theirs being a light Hatchet, with a Bevil edge on its left side, because it is to be used with one hand, and therefore hath a short Handle: But the Carpenters *Ax* being to hew great Stuff, is made much deeper and heavier, and its edge tapering into the middle of its Blade. It hath a long Handle, because it is used with both their hands, to square or bevel their Timber.

When they use the *Ax*, the Timber hath commonly some Bark or Log laid under it near each end, that the edge of the *Ax* may be in less danger of striking into the ground, when they hew near the bottom of the Timber. And they commonly stand on that side the Timber they hew upon.

S 2. Of the Adz, and its use.

THe *Adz* marked *B* in *Plate 8.* hath its Blade made thin, and some what arching. As the *Ax* hath its edge parallel to its Handle, so the *Adz* hath its edge at right to the Handle, and is ground to a Bevil on its inside to its outer edge; wherefore when it is blunt they cannot well grind it, unless they take its Helve out of its Eye.

Its general use is to take thin Chips off Timber or Boards, and to take off those irregularities that the *Ax* by reason of its form cannot well come at; and that a Plain (though rank set) will not make riddance enough with.

It is most used for the taking off the irregularities on the framed work of a Floor, when it is framed and pind together, and laid on its place; for that lying flat under them, the edge of the Ax being parallel to its Handle (as aforesaid) cannot come at the irregularities to take them off; but the *Adz* having its edge athwart the Handle will. Again, upon some Posts framed upright, and range with other framed work close to it, the edge of the *Ax* cannot come at the irregularities (for the reason aforesaid) but the *Adz* will. And the like for the irregularities of framed work on a Ceiling, &c.

When they work upon the framed work of a Floor, they take the end of the Handle in both their hands, placing themselves directly before the irregularity, at a small distance, straddling a little with both their Legs, to prevent danger from the edge of the *Adz*, and so by degrees hew off the irregularity. But if they hew upon an Upright, they stand directly before it.

They sometimes use the *Adz* upon small thin Stuff, to make it thinner; (but this is many times when the *Ax* or some other properer Tool lies not at hand) and then they lay their Stuff upon the Floor, and hold one end of it down with the Ball of the Foot, if the Stuff be long enough; if not, with the ends of their Toes, and so hew it slightly away to their size, or form, or both.

In general use is to take off those irregularities that the *Ax* cannot well come at, and that *Plane* (though thick) will not make it smooth enough with.

§ 3. Of Carpenters Chissels in general.

THough Carpenters for their finer work use all the sorts of *Chissels* described in *Exercise 4.* yet are not those sorts of *Chissels* strong enough for their rougher and more common work, and therefore they also use a stronger sort of *Chissels*; and distinguish them by the name of *Socket Chissels*: For whereas those *Chissels* Joyners use have their wooden heads made hollow to receive the Iron Sprig above the Shoulder of the Shank, Carpenters have their Shank made with an *hollow Socket* at its top, to receive a strong wooden Sprig made to fit into that *Socket*, with a square Shoulder above it, the thickness of the Iron of the *Socket*, or somewhat more; which makes it much more strong, and able to endure the heavy blows of the *Mallet* they lay upon the head of the *Chissel*. And the Shanks and Blades are made stronger for Carpenters use than they are for Joyners.

Of these *Socket Chissels* they have of the several sorts described in Joynerie, though not all severally distinguished by their names; for they call them *Half Inch*, *Three quarter Inch Chissels*, *Inch and half*, *Two Inch* to *Three Inch Chissels*, according to the breadth of the Blade. But their uses are the same mentioned in Joynerie, though the manner of using them be somewhat different too: For as I told you in Joynerie, the Joyners press the edge of the Blade into the Stuff with the strength of their Shoulders, but the Carpenters with the force of the blows of the *Mallet*. And the Joyners guide their *Chissels* differently from what the Carpenters do their *Socket Chissels*; for the Joyners hold the Shank and Blade of their *Chissels* as

I described in *Numb. 4. Sect. 11.* but the Carpenters hold the Shank of their *Chissels* in their clutched left hand, and beat upon the Head with the *Mallet* in the right. See the Figure of the *Socket-Chissel* in *Plate 8. C.* with its Head *a* out of the Socket.

s 4. *Of the Ripping Chissel, and its use.*

THe *Ripping Chissel* described *Plate 8. D.* is a *Socket Chissel*, and is about an Inch broad, and hath a blunt edge. Its edge hath not a *Bevel* as almost all other *Chissels* have, and therefore would more properly be called a *Wedge* than a *Chissel*. But most commonly Carpenters use an old cast off *Chissel* for a *Ripping Chissel*.

Its office is not to cut wood as others do, but to *rip or tear* two pieces of wood fastned together from one another, by entering the blunt edge of it between the two pieces, and then knocking hard with the *Mallet* upon the head of the Handle, till you drive the thicker part of it between the two pieces, and so force the power that holds them together (be it Nails or otherwise) to let go their hold. For its blunt edge should be made of Steel and well tempered, so that if you knock with strong blows of the *Mallet* the *Chissel's* edge upon a Nail (though of some considerable substance) it may cut or break it short asunder. If you cannot at once placing the *Ripping Chissel* part the two pieces, you must use two *Ripping Chissels*, placing the second at the remotest entrance in the breach, and driving that home will both open the breach wider, and loosen the first *Ripping Chissel*, so that you may take it out again, and place it further in the breach: And so you must con-

continue edging further and further till you have separated your intended pieces.

It is sometimes used when Carpenters have committed error in their work, and must undo what they did, to mend it. But it is generally used in all alterations and old work.


§ 5. *Of the Draw-knife, and its use.*

THE *Draw-knife* described *Plate 8. E.* is seldom used about House-building, but for the making of some sorts of Household-stuff; as the Legs of Crickets, the Rounds of Ladders, the Rails to lay Cheese or Bacon on, &c.

When they use it, they set one end of their work against their Breast, and the other end against their Work-bench, or some hollow angle that may keep it from slipping, and so pressing the work a little hard with their Breast against the Bench, to keep it steady in its position, they with the Handles of the *Draw-knife* in both their hands, enter the edge of the *Draw-knife* into the work, and draw Chips almost the length of their work, and so smoothen it quickly.

§ 6. *Of Hook-Pins, and their use.*

THE *Hook-Pin* is described *Plate 8. F.* *a the Pin,* *b the Hook,* *c the Head.* Its office is to pin the Frame of a Floor or Frame of a Roof together, while it is framing, or while it is sitting into its position. They have many of these *Hook-Pins* to drive into the several angles of the Frame. These they drive into the Rid-holes through the Mottles and Tennants, and being made taper, do with a Hammer striking on the

the bottom of  knock it out again; or they most commonly strike under the Hook, and so knock it out. Then if the Frame lie in its place, they pin it up with wooden Pins.

§ 7. *Of the Level, and its use.*

THe *Level* described *Plate 8. G.* *a a* the *Level*, *b* the *Plumbet*, *c* the *Plumb-line*, *d d* the *Perpendicular* mark'd from the top to the bottom of the Board. The *Level* is from two to ten foot long, that it may reach over a considerable length of the work. If the *Plumb-line* hang just upon the *Perpendicular d d*, when the *Level* is set flat down upon the work, the work is *Level*: But if it hang on either side the *Perpendicular*, the Floor or work must be raised on that side, till the *Plumb-line* hang exactly upon the *Perpendicular*.

§ 8. *Of the Plumb-line, and its use.*

THe *Plumb-line* is described *Plate 8. H.* *a* the *Line Rowl*, *b* the *Line*. It is used to try the upright standing of Posts, or other work that is to stand perpendicular to the Ground Plot; and then they draw off so much Line as is necessary, and fasten the rest of the Line there, upon the *Line Rowl* with a Slip knot, that no more Line run off. They hold the end of the Line between their Finger and Thumb half the Diameter of the *Line Rowl* off one corner of the Post or work, and if the *Line* and Corner of the Post be parallel to each other, the Post is upright: But if the Post be not parallel to the *Line*, but its bottom stands more than half the Diameter of the *Line Rowl* from
from

from the Line, the Post hangs so much over the bottom of the Post on that side the Line bears on, and must be forced backward still the side of the Post and the Line become parallel to each other. But if the bottom of the corner of the Post stand out from the top of the Line, the Post must be forced forwards to comply with the Line.

§ 9. Of the Hammer, and its use.

The Hammer is described Plate 8. 1. the Face, the Claw, & the Pen at the Yerm sides of the Claw. This Tool was forgot to be described in Joynery, though they use *Hammers* too, and therefore I bring it in here. Its chief use is for driving Nails into work, and drawing Nails out of work.

There is required a pretty skill in driving a Nail; for if (when you set the point of a Nail) you be not curious in observing to strike the flat Face of the Hammer perpendicularly down upon the Perpendicular of the Shank, the Nail (unless it have good entrance) will start aside, or bow, or break; and then you will be forced to draw it out again with the Claw of the Hammer. Therefore you may see a reason when you buy a Hammer, to chuse one with a true flat Face.

A little trick is sometimes used among some (that would be thought cunning Carpenters) privately to touch the head of the Nail with a little Cat-wax. And then lay a wager with a stranger to the Trick, that he shall not drive that Nail up to the Head with so many blows. The stranger thinks he shall assuredly win, but does assuredly lose; for the Hammer no sooner touches the Head of the Nail, but instead of entering the

to knock on the corners of Framed work, to set them in their position. It is also used to drive small wooden Piles into the ground, for where great Engines may be spent. The Hammer, though the use of Hammer too, and therefore I bring it in here, as being Nails in to work and drawing Nails out of work.

Of the Crow, and its use.

The Crow is described in *Plate 81*. It is a large iron tool, used to pull out heavy Timber, when it is too large to be drawn out by a Rope or a Bowler. It is to be laid under it, and then drop the Crow, and between the Ground and the Timber, and laying a Bark or Log, such stuff behind the Crow, they draw the other end of the Shaft backward, and so raise the Timber.

It is used to knock on the Corners of Framed work, to set them in their position. It is also used to drive small wooden Piles into the ground, for where great Engines may be spent. The Hammer, though the use of Hammer too, and therefore I bring it in here, as being Nails in to work and drawing Nails out of work.

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Of the Drag, and its use.

A little trick is sometimes used among some of the Artificers, and is described in *Plate 94*. It is made of a low narrow Cart, and is used for the carriage of Timber, and then is drawn by the Handle, by two or more men, according to the weight of the Timber they require.

There are also some Engines used in Carpenters for the management of their heavy Timber and hard

T

La-

feet to be a Scale for the same, a sheet of Paper will serve in its stead in length. And if you make every half an inch of an Inch upon a Scale for four Inches, a sheet of Paper will contain 40 Feet. And thus by diminishing the Scale, the sheet of Paper will contain a greater number of Feet.

Now having either elected, or else made your Scale, you are to open your Compasses to the number of Feet on your Scale your *Ground-plot* hath in length, and then transfer that distance to your Paper, and to draw a straight Line between the two Points, and mark that straight Line with *East, West, North, or South*, according to the situation of that side of the *Ground-plot* it represents. Then again open your Compasses to the number of Feet on your Scale one of the adjoining sides contains, and transfer that distance also to your Paper, and draw a Line between the two points, and note its situation of *East, West, North, or South*, as before. Do the like by the other sides, and if either a Quirk or any Addition be added to the Building, on any side of your *Ground-plot*, you must describe it also proportionally, but draw it.

Then you are to consider what Apartments or Partitions to make on your *Ground-plot*, or second or third Story, and to set them off from your Scale, beginning at your intended Front. As for example, suppose your *Ground-plot* be a Long square, 50 Feet in length, and 20 Feet wide. This *Ground-plot* will contain in its length two good Rooms, and a Yard behind it 10 Feet long. If you will, you may divide the 40 Feet into two equal parts, so will each Room be 20 Feet square. Or you may make the Rooms next the Front deeper or shallower, and leave the remainder for the Back Room. As here the Front Room

Room is 23 Foot, and the Back Room 15 Foot deep, and a setting off of 8 Foot broad and 10 Foot long taken out of the third, for a Buttery below stairs (if you will) and Closets above stairs over it. But what width and depth soever you intend your Rooms shall have, you must open your Compasses to that number of Feet on your Scale, and set off that Distance on the East, West, North or South Line, according to the Situation of that side it represents on your Ground-plot. If you set it off the East Line, you must also set it off on the West; if on the North Line, you must also set it off on the South Line. Because between the two Settings off on the East and West Lines, or North or South Lines, you must draw a straight Line of the length of your intended Partition. And in this manner you must from every Partition draw a Line in its proper place on the Paper, by measuring the Distances each Partition must have from the outside of the Ground-plot. And thus you are also to describe by your Scale your Front, and several sides of the Carcase, allowing the Principal Posts, Posts, Enterdouces, Quarterings, Braces, Gables, Doors, Windows, and Ornaments, their several sizes, and true positions by the Scale. Each side upon a Paper by it self: Unless we shall suppose our Master Workman to understand Perspective; for then he may on a single piece of Paper describe the whole Building, as it shall appear to the Eye at any assigned Station.

§ 14. Of Foundations.

HAVING drawn the Draft, the Master Workman is first to cause the Cellars to be dug, if the House shall have Cellars. And then to try the Ground, that it be all over of an equal firmness, that when the weight

of the Building is collapsed in, it may not sink in any part. But if the Ground be soft, or decayed in any place, he strengthens it, consolidates it, & ramming it down, and levelling it again with good dry Earth, Lime-Cor, Rubbish, &c. or sometimes with ramming in Stones, or sometimes with well Planking it, or most securely by driving in Piles. But driving in of Piles is seldom used for Timber Houses, but for Stone or Brick Houses, and that but in low places of England neither, but where the Ground proves *fenny*, or *moorish*. Therefore a further account shall be given of Foundations, when I come to discourse upon Masters. But to say I will say no more of this subject, and I leave the Cellars Walls to be brought up by a *Bricklayer*, with *Bricks*, for small Houses two Bricks thick, for bigger two and an half Bricks thick, or three or four Bricks thick, according to the bigness of the House, and quality of the Ground, I shall then when I come to Exercise on *Bricklaying*, have said all.

But if the House be designed to have no Cellars (as many Country Houses have not yet for the better securing the Foundation, and preserving the Timber from rotting, Master Workmen will cause three or four or five courses of Brick on behid, to lay their Ground floor upon that Foundation.

The Foundation being made good, the Master-workman appoints his under-workmen their several *Seasons*, for *Ground-plate*, *Principal Posts*, *Posts*, *Bresssumers*, *Girders*, *Trimmers*, *Joists*, &c. which they cut square, and frame their Timbers so, as has been taught in the several Exercises upon *Joistery*, (whither I refer you) and there set them up, each in his proper place, according to the *Draft*, and shall

The

The Draft of the Foundation I have described in
Plate 10, according to a Scale of eight Foot in an
Inch, where you have the Front A B 20 Foot long,
the Sides A C and B D 50 Foot long. The Shop or
first Room E F 25 Foot (as aforesaid) deep. I make
the first Room a Shop, because I intend to describe
Shop windows, Stalls &c. though you may Build ac-
cording to any other purpose: the Kitching or Back
Room F F 15 Foot deep. A Buttery or Closet taken
out of the Yard, marked G, 10 foot deep, and 8 foot
wide. H a Setting off in the Yard, 4 foot square for
the House of Office. I Leaving way in the Shop for a
Stair Case 6 foot, and 11 foot. K the Yard. L the
Sink-hole 1 foot square. M Leaving way in the Kitch-
ing 6 foot deep, and 4 foot wide for the Chimneys.

I do not deliver this Draft of Partitions for the
most commodious for this Ground-plot, nor is the
House set out designed for any particular Inhabitant;
which is one main purpose to be considered of the
Master-Workman, before he make his Draft; for a
Gentlemans house must not be divided as a Shop-
keepers, nor all Shop-keepers Houses alike; for some
Trades require a deeper, others may dispense with a
shallower Shop; and so an inconvenience may arise
in both. For if the Shop be shallow, the Front
Rooms upwards ought to be shallow also: because
by the strict Rules of Architecture, all Partitions of
Rooms ought to stand directly over one another:
for if your Shop stand in an eminent Street, the Front
Rooms are commonly more Airy than the Back
Rooms; and always more commodious for obser-
ving publick Passages in the Street, and in that re-
spect it will be inconvenient to make the Front
Rooms shallow: But if you have a fair Prospect
back-

backwards of Gardens, Fields, &c. (which sometime happens in Cities) then it may be convenient to make your Back Rooms the larger for Entertainment, &c. But I shall run no further into this Argument, for I shall leave the Matter workman to consult Books of *Architecture*, and more particularly the Builder, which in this case they all ought to do.

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Numb. VIII.

MECHANICK EXERCISES.

O R,

The Doctrine of

Handy-works.

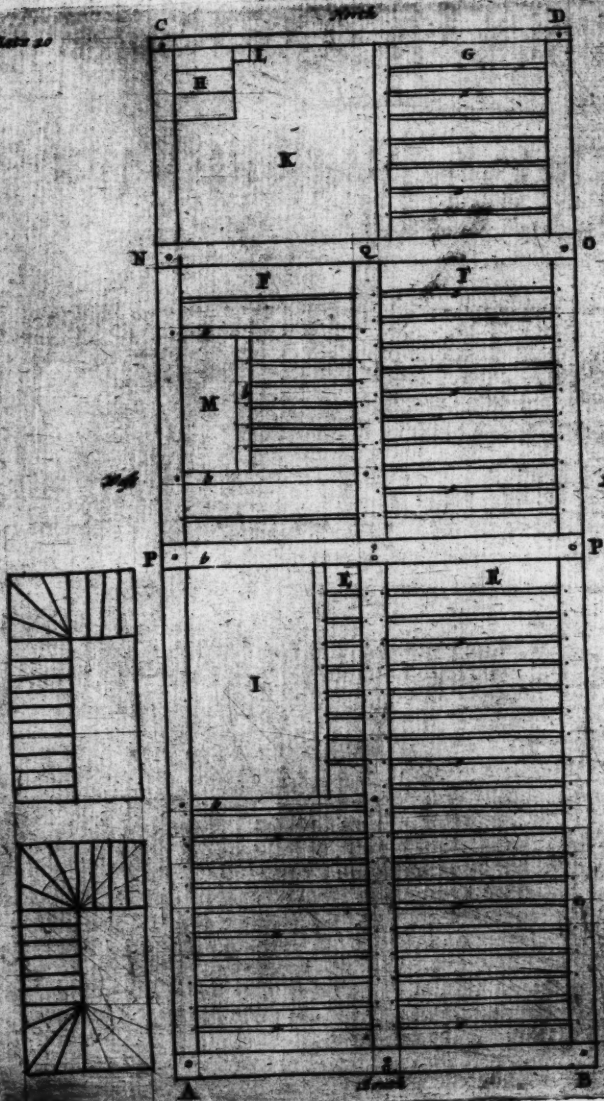
Applied to the Art of House-Carpentry.

By *Joseph Moxon*, a Member of
the Royal Society, and Hydrographer
to the King's most Excellent Majesty.



L O N D O N,

Printed for *Joseph Moxon*, at the Sign of *Atlas* on
Lnsgate Hill. 1679.



MECHANICK EXERCISES,

OR,

The Doctrine of Handy-works : appli-
ed to the Art of House-Carpentry.

A C, B D, C D, N O, Ground-plates, Wall-plates, Bressummers, Lintels, the Thickness of the Wall.

A B, Also a Ground-plate, or Ground-sell.

P P, The Summer.

Q Q Q, Girders.

I, The Well-boule for the Stairs, and Stair-case.

M, Leaving a way for the Chimnies.

b b, Trimmers for the Chimney way and Stair-case.

a a a a, Joys.

§ 15. Of Framing for the Floors.

THe four Plates, **A B, A N, N O** and **B O**, lying on the Foundation, are called Ground-plates. They are to be of good Oak, and for this size of Building about 8 Inches broad, and 6 Inches deep. They are to be framed into one another with Tennants and Mortelles. The longer Ground-plates **A N** and **B O** are commonly tenanted into the Front and Rear Ground-plates **A B** and **N O**, and into these two side-Ground-plates are Mortelles made for the Tennants at the ends of the Joys, to be fitted somewhat loosely in, at about 10 Inches distance from one another, as in the Draft. These Ground plates are to be bor'd with

an Inch and half *Augur*, and well pinned into one another with round Oaken Pins, made tapering towards the point, and so strong, that with the hard blows of a Mallet, they may drive stiff into the *Augre hole*, and keep the Tennant firmly in the Mortels. The manner of making a Tennant and Mortels is taught in *Exercise 3. § 17.* But because the Stuff *Carpenters* work upon, is generally heavy Timber, and consequently not so easily mannaged as the light Stuff *Joyners* work upon, therefore they do not at first pin their Tennants into their Mortelles with wooden Pins, lest they should lie out of square, or any other intended Position: but laying a *Block* or some other piece of Timber under the corner of the Framework to bear it hollow off the Foundation, or what ever else it lies upon, they drive *Hook Pins* (described *Plate 8, § 6.*) into the four *Augre-holes* in the corners of the Ground-plates, and one by one fit the Plates either to a square, or any other intended Position: and when it is so fitted, they draw out their *Hook Pins*, and drive in the Wooden Pins (as aforesaid) and taking away the wooden *Blocks* one by one from under the corners of the Frame, they let it fall into its place.

But before they pin up the Frame of Ground-plates, they must fit in the *Summer* marked *PP*, and the *Girders QQ* and all the *Joists* marked *aaaa* &c. and the *Trimmers* for the *Stair-case*, and *Chimney way* marked *bb*, and the binding *Joists* marked *cc*, for else you cannot get their Tennants into their respective Mortels holes. But they do I say fit all these in while the frame of Ground-plates lies loose, and may corner by corner be opened to let the respective Tennants into their respective Mortelles, which when all

all is done, they frame the *Raising-plates* just as the *Ground-plates* are framed; and then frame the Roof into the *Raising-plates* with *Beams*, *Joists*, &c.

The *Summer* is in this *Ground-plate* placed at 25 foot distance from the Front, and is to be of the same scantlin the principal Plates are of; for Reasons as shall be shewn hereafter: and the *Girders* are also to be of the same Scantlins the *Summer* and *Ground-Plates* are of, though according to the nice Rules of *Architecture*, the *Back-Girder* need not be so strong as the *Front-Girder*, because it Bears but at 14 foot length, and the *Front-Girder* Bears at 24 foot length: yet Carpenters (for uniformity) generally make them so, unless they build an House by the great, and are agreed for the Sum of Money.

The *Joists* Bearing at 8 Foot (as here they do) are to be 7 Inches deep, and 3 Inches Broad.

The *Trimmers*, and *Trimming Joists* are 5 Inches broad and 7 Inches deep, and these *Joists*, *Trimmers* and *Trimming Joists*, are all to be pinned into their respected *Mortelles*; and then its flatness try'd with the *Level*, as was taught § 7.

§ 16 Of setting up the Carcass.

Though the *Ground-plates*, *Girders*, &c. be part of the *Carcass*, yet I thought fit in the last Section they should be laid, before I treated of the superstructure, which I shall now handle. The four *Corner Posts* called the *Principal Posts* marked A A, should be each of one piece, so long as to reach up to the *Beam* of the *Roof*, or *Raising-Plate*, and of the same Scantlin the *Ground-Plates* are of, viz. 8 Inches broad, and 6 Inches thick, and set with one of its

narrowest sides towards the Front. Its lower end is to be Tennanted, and let it into a Mortise made near the corner of the *Ground Plate Frame*; and its upper end hath also a Tennant on it, to fit into a Mortise made in the Beam of the Roof or *Raising piece*.

At the height of the first story in this *Principal Post*, must be made two Mortises, one to receive the Tennant at the end of the *Bressummer* that lies in the Front, and the other to entertain the Tennant at the end of the *Bressummer* that lies in the Return side.

Two such Mortises must also be made in this *Principal Post* at the height of the second story, to receive the Tennants at the ends of the *Bressummers* for that story.

Though I have spoken singularly of one *Principal Post*, yet as you work this, you must work all four *Principal Posts*; and then set them plumb upright, which you must try with a Plumb-line described in *Plate 8*.

Having erected the *Principal Posts* upright, you must enter the Tennants of the *Bressummers* into their proper Mortises, and with a Nail or two (about a single Ten or a double Ten) tack one end of a deal Board, or some other light piece of stuff to the *Bressummer*, and the other end to the frame work of the Floor, to keep the *Principal Posts* upright, and in their places. Then set up the several Posts between the *Principal Posts*; but these Posts must be Tennanted at each end, because they are to be no longer than to reach from story to story, or from Entertise to Entertise, and are to be framed into the upper and under *Bressummer*. If the Entertises be not long enough, they set up a *Principal Post* between

tween two or three lengths, to reach from the Ground plate up to the Raising plates.

It is to be remembred, that the Bressummers and Girders are laid flat upon one of their broadest sides, with their two narrowest sides perpendicular to the Ground-Plot; but the Joysts are to be laid contrary: for they are framed so as to lie with one of their narrowest sides upwards, with their two broadest sides perpendicular to the Ground-Plot. The reason is, because the Stuff of the Bressummers and Girders are less weakned by cutting the Mortesses in them in this position; than in the other position; for as the Tennants for those Mortesses are cut between the top and bottom sides, and the flat of the Tennants are no broader than the flat of the narrowest side of the Joysts; so the Mortesses they are to fit into, need be no broader than the breadth of the Tennant, and the Tennants are not to be above an inch thick, and consequently the Mortesses are to be made with an Inch Mortess-Chissel, as was shewn Numb. 5. § 17. for great care must be taken that the Bressummers and Girders be not weakned more than needs, least the whole Floor dance.

These Tennants are cut through the two narrowest sides, rather than between the two broadest sides, because the stuff of the Girders retains more strength when least of the Grain of the stuff is cut: And the Tennants being made between the narrowest sides of the Joyces, require their Mortess-holes no longer than the breadth of that Tennant: And that Tennant being but an Inch thick, requires its Mortess but an Inch wide to receive it; so that you Mortess into the Girder no more than three Inches wide with the Grain of the Stuff, and one Inch broad contrary to

to the Grain of the Stuff. But should the Tennant be cut between the two broad sides of the Joysts; the Mortefs would be three Inches long, and but one Inch broad, and consequently, you must cut into the Girder three Inches cross the Grain of the Stuff, which would weaken it more than cutting six Inches with the Grain and one Inch cross.

But it may be objected that the Tennants of the Joysts being so small, and bearing at an Inch thickness must needs be too weak.

Answer, first, though the Tennants be indeed but an inch thick, and three Inches broad; yet the whole Bearing of the Joyces do not solely depend upon their Tennants; because the Girders they are framed into, prove commonly somewhat Wainny upon their upper sides, and the Joysts are always scribed to project over that Wayniness, and so strengthen their Bearing by so much as they project over the roundness or wayniness of the upper side of the Girder.

Secondly, the Floor is boarded with the length of the Boards athwart the Joysts, and these Board firmly railed down to the Joysts, which also adds great strength to them.

Thirdly, The Joysts are seldome made to Bear : at above ten foot in length, and should by the Rule of good workmanship not lie above ten Inches : sunder at the most : so that this short Bearing an close discharging of one another, renders the whole floor firm enough for all common occupation. But if the Joyces do bear at above ten foot in length, it ought to be the care of the Master Workman to provide stronger stuff for them, viz. Thicker and Broader. If not, they cut a Tusk on the upper side of the Tennant, and let that Tusk into the upper side of the Girders.

Ha-

Having erected the Principal Post, and other Posts, and fitted in the Bressummers, Girders, Joysts, &c. upon the first Floor, they pin up all the Frame of Carcase-work. But though the Girders and Joysts described for this first floor, lie proper enough for it; yet for the second story, and in this particular case, the Joysts lie not proper for the second story; because in the second story we have described a *Balcony*.

Therefore in this case you must frame the Front-Bressummer about seven Inches lower into the Principal Posts: Because the Joysts for the second Floor are not to be Mortised into the Bressummer to lie even at the top with it, but must lie upon the Bressummer, and project over it so far as you design the *Balcony* to project beyond the Upright of the Front: And thus laying the Joysts upon the Bressummer renders them much stronger to bear the *Balcony*, than if Joysts were Tennanted into the Front of the Bressummer, and so project out into the Street from it.

But the truth is, Though I have given you a Draft of the Joysts lying athwart the Front and Rear for the first Floor, you may as well lay them Range with the two sides on the first Floor. But then the Bressummer that reaches from Front to Rear in the middle of the Floor must be stronger: And Girders must then be Tennanted into the Bressummer, and the Ground-plates at such a distance, that the Joysts may not Bear at above ten Foot in length. And the Tennants of the Joysts must be tennanted into the Girders, so that they will then lye Range with the two Sides.

But, a word more of the Bressummer: I say (as before) the Bressummer to Bear at so great length must be

be stronger, though it should be discharged at the length of the Shop, (*viz.* at 25 Foot) with a Brick Wall, or a Foundation brought up of Brick. But if it shall have no Discharge of Brick-work, but Bear at the whole 40 Foot in length, your Bressummer must be yet considerably stronger than it need be, were it to Bear but 25 Foot in length; because the shorter all the Bearings of Timbers are, the firmer they Bear. But then the Framing work will take up more labour: And in many cases it is cheaper to put in stronger stuff for long Bearings, than to put a Girder between to Discharge the length of the Joysts to be framed into the Girders.

But to make short of this Argument, I shall give you the Scheme of Scantlins of Timbers at several Bearings for *Summers, Girders, Joysts, Rafter, &c.* as they are set down in the Act of Parliament for the rebuilding the City of London, after the late dreadful Fire: which Scantlins were well consulted by able Workmen before they were reduced into an Act.

Scantlings of Timber for the first sort of Houses.

	Foot	Inches	Inches
For the Floor {	Summers under	15	and 8
	Wall-plates	7	and 5
For the Roof {	Foot { at foot — 6 } 6 Inches		
	Principal Rafters under	15	at top — 5
	Single Rafters	4	and 3 Inches
	Length Foot	Thickness	Depth
Joysts to	10	3	and 7 Inches
Garret floors	3		6

Scant-

Scantlings of Timber for the other two sorts of Houses.

	Foot	Breadth		Depth	Thickness	Depth
		Foot	Inches		Inches	Inches
Summers or Girders which bear in length from	10—	to—15—	11—	and—8	Joyfts	{ 3—6
	15—	—18—	13—	—9	which	{ 3—7
	18—	—21—	14—	—10	bear	{ 3—7
	21—	—24—	16—	—12	10	{ 3—8
	24—	—26—	17—	—14	foot	{ 3—8
Principal Discharges upon Peers in the first Story in the Fronts			Inches	Inches		
			13	and 12		
			15—	—13		
Binding Joyfts with their Trimming Joyfts					Thickness	Inches
					5—	depth equal to their own floors
Wall-plates, or Raifing Pieces and Beams			Inches	Inches		
			10	and 6		
			8—	—6		
			7—	—5		
Lintels of Oak in the			Inches	Inches		
			1st. and 2d. Story—	8 and 6		
			3d. Story—	5—4		
Principal Rafters					Length	Thickness
			Foot	Foot	Inches	Inches
	from	15 to 18	{ at foot	9		
			{ at top	7		
		18—21	{ at foot	10		
			{ at top	8		
Principal Rafters	from	21—24	{ at foot	12		
			{ at top	9		
		24—26	{ at foot	13		
			{ at top	9		
Purlines from					Length	Thickness
			Foot	Foot	Inches	Inches
		15 to 18	—	—	9	—8
		18—21	—	—	12	—9
Single Rafters					Foot	Inches
					Inches	Inches
		not exceeding in length	—	—	9—5	—4
		not exceeding in length	—	—	6—4	—3½

X

Scant.

Scantlings for Sawed Timber and Laths, usually brought out of the West Countrey, not less than

	Breadth		Thickness	
	Foot	Inches	Inches	
Single Quarters in length	8	3 $\frac{1}{2}$	1 $\frac{1}{4}$	
Double Quarters in length	8	4	3 $\frac{1}{2}$	
Sawed Joysts in length	8	6	4	
Laths in length	$\left\{ \begin{array}{l} 5 \\ 4 \end{array} \right.$ — 1 $\frac{1}{4}$ — 1 quarter and $\frac{1}{2}$ Inch			

		Inches	
Stone.	Corner Peers	18	square
	Middle or single Peers	14	and 12
	Double Peers between House and House	14	and 18
	Door-Jambs and Heads	12	and 8
Where Stone is used, to keep to these Scantlings	1st fort		
	2d & 3d forts		
	Corner Peers	2	6 square
	Middle or single Peers	18	square
	Double Peers between House and House	24	and 18
	Door-Jambs and Heads	14	and 10

	Foot	Thickness	
Scantlings { 3 wide }	Side-walls	1 Brick $\frac{1}{2}$	Bottom paved plain, and then 1 Brick on edge circular.
for Sewers { 5 high }	Arch	1 Brick on end	

General Rules.

IN every Foundation within the Ground adde one Brick in thickness to the thickness of the Wall (as in the Scheme) next above the Foundation, to be set off in three Courses equally on both sides.

That no Timber be laid within twelve Inches of the foreside of the Chimney Jambs : And that all Joysts on the back of any Chimney be laid with a Trimmer at six Inches distance from the Back.

That

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That no Timber be laid within the Tunnel of any Chimney, upon penalty to the Workman for every default Ten Shillings, and Ten Shillings every week it continues unreformed.

That no Joys^ts or Rasters be laid at greater distances from one to the other, than twelve Inches; and no Quarters at greater distance than fourteen Inches.

* That no Joys^ts bear at longer length than Ten Foot; and no single Rasters at more in length than Nine Foot.

That all Roofs, Window-frames, and Cellar-floors be made of Oak.

The Tile-pins of Oak.

No Summers or Girders to lie over the Head of Doors and Windows.

No Summer or Girders to lie less than Ten Inches into the Wall, no Joys^ts than Eight Inches, and to be laid in Lome.

But yet the Carcass is not completed, till the Quarters and Braces between the principal Posts and Posts are fitted in; the Window Frames made and set up, and the Principal Rasters, Purlins, Gables, &c. are also fram'd and set up. The manner of their Pitch and Scantlins you will see in Plate 11. And the reasons for several Pitches you may find among Books of Archi-

teſture. But the names of every Member you will find in the *Alphabetical Table* at the later end of theſe Exercises on *Carpentry*, referred unto by Letters and Arithmetical Figures in the Plate aforeſaid.

But now we will ſuppoſe the Carcaſs is thus finiſhed. The Bricklayer is then to bring up the *Chilminies*, and afterwards to *Tile* the Houſe. And then the next work the Carpenter has to do, is to Bring up the *Stairs* and *Stair-Caſes*, and afterwards to *Floor* the Rooms, and *Hang* the *Doors*, &c. For ſhould he either Bring up the *Stairs* and *Stair-Caſes*, or *Floor* the Rooms before the Houſe is *Tiled* or otherwiſe covered, if wet Wether ſhould happen it might injure the *Stairs*, *Flooring*, &c.

A,

- A, The Ground-plate, or Ground-sell.
 B B, B B, The Principal Posts.
 C C, The Binding Intertises, or indeed more properly Interduces, Bressummers, Girders.
 D, Beam of the Roof, Bressummer, or Girder to the Garret Floor.
 E E, Principal Rafter. FF, Bressummers.
 G, Plate or Raising-piece, also a Beam.
 a a, Jamns or Door-posts. b b, Braces. c c, Jamns.
 d, Top-rail of the Balcony.
 e e, Bottom-rail of the Balcony.
 f f f, Posts of the Balcony.
 g g g, Banisters.
 h h, Bressummers for the Shop-windows.
 H, King-piece or Joggle-piece.
 i i, Struts.
 k k, Top-beam, Coller-beam; Wind-beam, Strut-beam.
 l l l, Door-head.
 I I, The Feet of the principal Rafter.
 K, The Top of the Rafter.
 I I K, The Gable-end.
 L L, Knees of the Principal Rafter, to be made all of one piece with the Principal Rafter.
 M, The Fust of the House.
 N N, Purlins.
 O O, Shop-windows.
 P P, Flaps or Falls.
 m m m, Quarters.
 n n, Jamns of the Window.
 o o, Back and Head of the Window.
 p p, Transoms.
 q q, Munnions.
 r r, Furrings, or Shreadings.
 V, Single light Windows or Luteons.
 s s s, Rafter.

§ 16. Of Window Frames.

IN Brick Buildings the *Window Frames* are so framed, that the Tennants of the Head-sell, Ground-sell, and Transum run through the outer *Jaums* about four Inches beyond them: And so they are set in a Lay of Morter upon the Brick Wall before the *Peers* on either side is brought up, at about three Inches within the Front: So that the Brick work over the Head and about the *Jaums* defend it from the weather. Then the *Bricklayer* brings up the *Peers* on both sides, so that the four ends or Tennants that project through the outer *Jaums* being buried and trimmed into the Brick-work become a Fastning to the *Window-Frame*.

But if the *Window-Frame* stands on a Timber-house, the Head and Groundsell are sometimes Tennanted into the *Posts* of the *Carcafs*; and then the *Posts* do the office of the outer *Jaums* of the *Window-Frame*; and the Head and Ground-sell are then called *Entertises*, and therefore both Head and Ground-sell, and *Posts* or *Jaums*, are rabbetted about half an Inch on the outside of the Front, to receive the Pane of Glas that is fitted to it. And thus (as I said) the *Posts* become part of the *Window-Frame*.

But the better way is to frame a *Window* as the *Brick-work Window*, and to project it an Inch and an half beyond the side of the Building, and to plaster against its sides, for the better securing the rest of the *Carcafs* from the weather.

The *Window Frame* hath every one of its *Lights* rabbetted on its outside about half an Inch into the
Frame

Frame, and all these *Rabbets*, but that on the Ground-fell are grooved square, but the *Rabbets* on the Ground-fell is bevell'd downwards, that Rain or Snow, &c. may the freelier fall off it. Into these *Rabbets* the several Panes of Glas-work is set, and fastned by the Glasier; as shall be shewed when I come to Exercise upon *Glasing*.

The square Corners of the Frame next the Glas is Bevell'd away both on the out and inside of the Building, that the Light may the freelier play upon the Glas. And upon that Bevel is commonly Stuck a Molding (for Ornament sake) according to the fancy of the Workman, but more generally according to the various Mode of the Times.

§ 17. Of Stairs, and Stair-Cases.

Several Writers of *Architecture* have delivered different Rules for the Heighth and Breadth of *Steps*, and that according to the several Capacities of the *Stair-Cases*. They forbid more than six, and less than four Inches for the Heighth of each Step, and more than sixteen, and less than twelve, for the Breadth of each Step. But here we must understand they mean these Measures should be observed in large and sumptuous Buildings: But we have here proposed an ordinary private House, which will admit of no such Measures, for want of room. Therefore to our present purpose.

The first and second Pair of Stairs the Steps shall be about $7\frac{1}{2}$ Inches high, and 10 Inches broad. The third Pair of Stairs each Step may be about $6\frac{1}{2}$ Inches high, and $9\frac{1}{2}$ Inches broad. And for the fourth Pair of Stairs, each Step may be about 6 Inches high, and 9 Inches

Inches broad But this Rule they do or should follow, *viz.* to make all the Steps belonging to the same pair of Stairs of an equal heighth; which to do, they first consider the heighth of the Room in Feet and od Inches, if any od be, and multiply the Feet by 12, whose Product with the number of od Inches, gives the sum of the whole Heighth in Inches; which summe they divide by the number of Steps they intend to have in that Heighth, and the Quotient shall be the number of Inches and parts that each Step shall be high. Or, if they first design the Heighth of each Step in Inches, they try by Arithmetick how many times the Heighth of a Step they can have out of the whole Heighth of the Story, and so know the number of Steps.

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Numb. IX.

MECHANICK EXERCISES.

O R,

The Doctrine of

Handy-works,

Applied to the Art of House-Carpentry.

By *Joseph Moxon*, a Member of
the Royal Society, and Hydrographer-
to the King's most Excellent Majesty.



L O N D O N,

Printed for *Joseph Moxon*, at the Sign of *Atlas* on
Ludgate Hill. 1679.

Number IX.

MECHANICK EXERCISES

The Doctrine of

Sound-works.

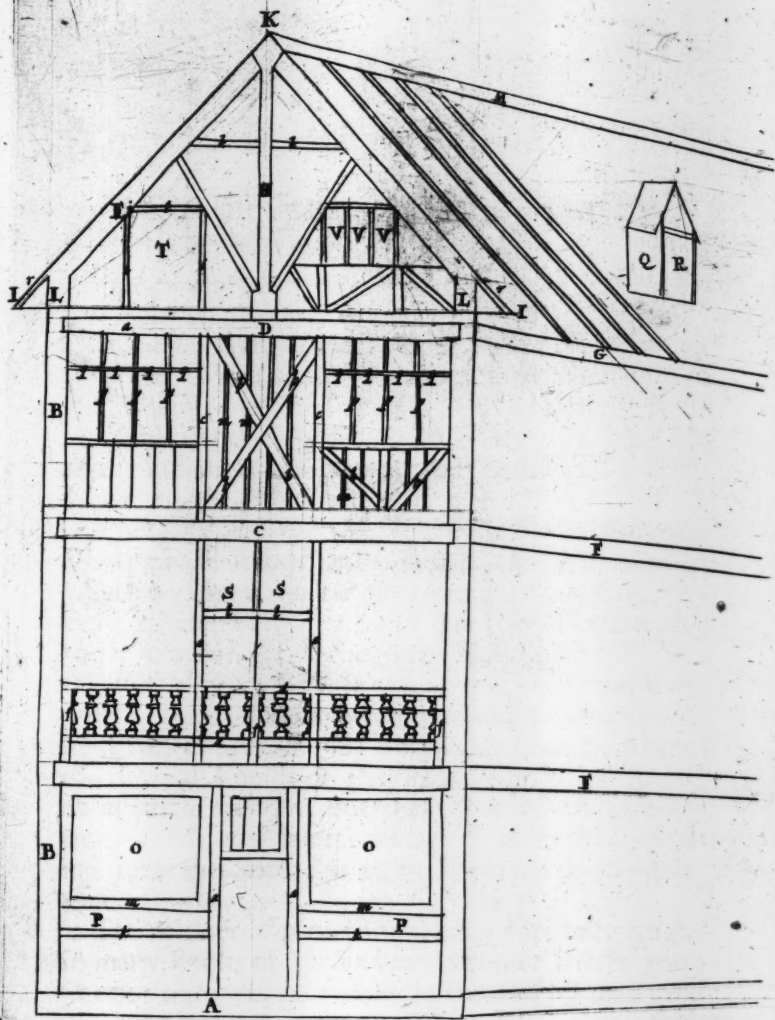
Applied to the Art of Hoyle's Cannon.

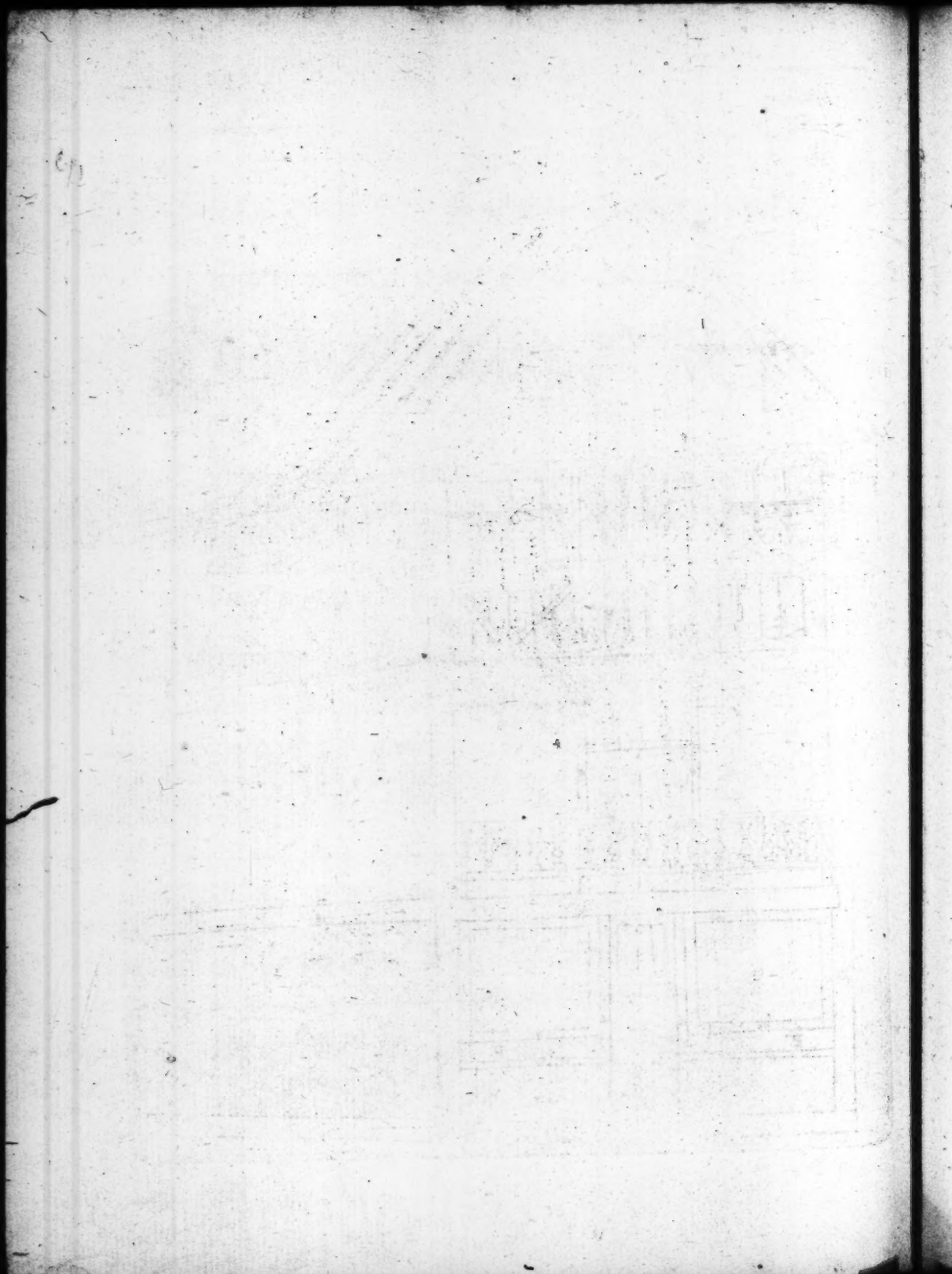
By Joseph Moxon, a Member of
the Royal Society, and Hydrographer
to the King's most Excellent Majesty.



L O N D O N

Printed for Joseph Moxon, at the Sign of the
Ladgate Hill 1679





MECHANICK EXERCISES,

O R,

The Doctrine of *Handy-works*: applied to the Art of *House-Carpentry*.

STairs are either made about a *Solid Newel*, or an *Open Newel*, and sometimes mixt, *viz.* with a *Solid Newel* for some few Steps; then a straight or *Foreright Ascent*, with *Flyers* upon the side of the square *Open Newel*, and afterwards a *Solid Newel* again. Then reiterate, &c.

The last, *viz.* the *Mixt Newel'd Stairs*, are commonly made in our *Party-walled Houses* in *London*, where no *Light* can be placed in the *Stair-Cafe*, because of the *Party-walls*; so that there is a necessity to let in a *Sky-light* through the *Hollow Newel*: But this sort of *Stair-Cases* take up more room than those with a single solid *Newel*; because the *Stairs* of a solid *Newel* spread only about one small *Newel*, as the several *Foulds* of the *Fans Women* use spread about their *Center*: But these, because they sometimes wind, and sometimes fly off from that winding take therefore the more room up in the *Stair-Cafe*.

The manner of projecting them, is copiously taught in many Books of *Architecture*, whither I refer you: yet not to leave you wholly in the dark, I shall give

Y

you

you a small light into it. And first of the *Solid Newel*.

Winding Stairs are projected on a round *Profile*, whose Diameter is equal to the Base the Stair-Cale is to stand on, suppose six foot square. This *Profile* hath its Circumference divided into 16 equal parts. The Semi-diameter of the *Profile* is divided into four equal parts, and one of them used for the *Newel*, and the rest for the length of the Steps: If you draw Lines from the Center through every one of the equal parts into the Circumference, the space between every two Lines will be the true Figure of a *Winding Step*. And if they were all cut out and placed one above another over the true place on the *Profile* round about a *Newel*, whose Diameter is one quarter the length of a Step, you would by supporting each Step with a *Raiser* have the model of a true pair of *Winding Stairs*. See Plate 10. Fig. 2.

Hollow Newel'd Stairs are made about a square *Hollow Newel*. We will suppose the *Well-hole* to be eleven foot long, and six foot wide; and we would bring up a pair of Stairs from the first *Floor* eleven foot high; it being intended that a Skie-light shall fall through the *Hollow Newel* upon the Stairs: we must therefore consider the width and breadth of the *Hollow Newel*; and in this example admit it to be two foot and a half wide, and two foot broad: by the width I mean the sides that range with the Front and Rear of the Building, and by the breadth I mean the sides that range with the Party-walls.

I find (by the Rule aforesaid) that if I assign 18 Steps up, each Step will be seven Inches and one third of an Inch high.

You must note, that the flying off, or else winding

ing of these Steps will vary their places according as you design the first Ascent. For if you make the first Ascent as you come straight out of the Street (as in Plate 10.) on the South side, you will first ascend upon a Pitch of *Flyers*, which Pitch (making an Angle of 38 deg. with the Floor) with ten Steps raise you six Foot high above the Floor, and bring you eight Foot towards the North end of the *Well-hole*, by making each Step ten Inches broad.

But now you must leave *Flyers*, and make four Winding Steps. These Winding Steps are made about a solid *Newel* (as hath been taught) and this *Newel* serves also for a *Post* to *Trim* the *Stair-Case* too. This *Post* stands upon the Floor, and is prolonged upwards so high, that *Mortesses* made in it may receive the *Tennants* of the *Top* and *Bottom Rails* of the whole *Stair-case* for that Floor: these four Winding Steps aforesaid, rounding one quarter about the *Newel*, turns your Face in your Ascent now towards the *East*: these four steps are raised 2 foot, 5 $\frac{1}{2}$ Inches above the *Flyers*, so that (in all) your Stairs are now raised 8 foot 6 $\frac{1}{2}$ Inches. Here remains now only 2 foot 5 $\frac{1}{2}$ Inches to the *Landing place*, and these take up just four *Flyers*, which must be made as was taught before.

But now in your second pair of Stairs it will be proper to begin your Ascent with your Face towards the *West*: for landing by the first pair of Stairs with your Face towards the *East*, you turn by the side of the Rail on the second Floor from the *East* towards the *North*, and at the further end of that Rail you turn your Face again from the *North* towards the *West*, and begin your Ascent on the second pair of Stairs.

Between the Skie-light and the Ascent is a Post set upright to fasten Rails into: (to bound the Stair-case) from the bottom of which, viz. on the second Floor you trim up three Flyers, and then turn off a quarter of a Circle; with Winding steps: then again, Flyers to your designed pitch: and then again another quarter of a Circle with winding steps, &c.

The Rail these Steps are built upon, being at the beginning or bottom of the Ascent framed or otherwise fastned to the first upright Post, must at its higher end be framed into the next Post also, with a Bevel Tennant, as you were taught to frame *Quarters* into one another, *Numb. 5. § 17.* Only with this difference, that there you were taught to frame Square; But here you must frame upon the *Bevel*, as you were taught, *Numb. 5. § 19.* This Post aforesaid Bears upon the Floor, to make its Bearing the stronger; and this Post must be continued to such an heighth, as it may also serve to receive the Tennanted end of an upper and lower Rail framed into it. And between these *Bevelling Rails Bannisters* make good the outside of the *Stair-Case*.

Though I have here described this Contrivance of a pair of Stairs, yet do I not deliver it as the best Patern for this Building, or for these sorts of Stairs, nor matters it to our purpose whether it be or no; for (as I told you before) my undertaking is the *Doctrine of Handy-works*; not *Architecture*; but tis *Architecture* considers the best forming of all Members in a Building for the capacitie of the Ground-Plot, and the Convenience of the intended Inhabitant; but Carpenters (as Carpenters) only work by directions prescribed by the Architect.

These therefore are the common Rules that these
forts

sorts of Stairs, and indeed all others with carving according to the Profile or Ground-plot of the Stairs are made by. But those that will see many Inventions may consult Books of *Architecture*, &c.

§ 18. Of Flooring of Rooms.

THough Carpenters never floor the Rooms till the Carcass is set up, and also inclosed by the Plasterer, left weather should wrong the Flooring; yet they generally *Rough-plain* their *Boards* for Flooring before they begin any thing else about the Building, that they may set them by to season: which thus they do, They lean them one by one on end assant with the edge of the Board against a *Bauk*, somewhat above the height of half the length of the Board, and set another Board in the same posture on the other side the *Bauk*, so that above the *Bauk* they cross one another: then on the first side they set another Board in that posture, and on the second side another, till the whole number of Boards are set an end: being set in this posture, there remains the thickness of a Board between every Board all the length, but just where they cross one another, for the Air to pass through to dry and shrink them, against they have occasion to use them: But they set them under some covered Shed, that the Rain or Sun comes not at them: for if the Rain wet them, instead of shrinking them, it will swell them; or if the Sun shine fiercely upon them, it will dry them so fast, that the Boards will *Tear* or *Shake*, wick is in Vulgar English *Split* or *Crack*.

They have another way to dry and season them,

b

by laying them flat upon three or four Bauks, each Board about the breadth of a Board asunder, the whole length of the Bauks. Then they lay another Lay of Boards athwart upon them, each board also the breadth of a Board asunder; then another Lay athwart the last, till all are thus laid: so that in this position they also lie hollow for the Air to play between them.

Thus then, The Boards being Rough-plain'd and Season'd. They try one side flat, as by *Numb. 6. § 31.* and both the edges straight, as if they were to shoot a Joynt; as by *Numb. 4. § 4.* and cut the Boards to an exact length: because if the Boards are not long enough to reach athwart the whole Room, the ends may all lie in a straight Line, that the straight ends of other Boards laid against them may make the truer Joynt, and this they call a *Beaking Joynt*. But before they lay them upon the Floor, they try with the *Level* (described § 7.) the flatness of the whole Frame of Flooring again, lest any part of it should be *Cast* since it was first framed together: and if any part of the Floor lie too high, they with the *Adz* (if the eminency be large) take it off, as was shewed § 2. Or if it be small, with the *Jack-Plane*, in *Numb. 4. § 2.* till it lie level with the rest of the Floor. But if any part of the Floor prove hollow, they lay a Chip or some such thing upon that hollow place, to bear up the Board, before they nail it down.

All this being done, they chuse a Board of the commonest thickness of the whole Pile for the first Board, and lay it close against one side of the Room athwart the Joynts, and so nail it firmly down with two Brads into every Joynt it crosses, each Brad a-
bout

bout an Inch, or an Inch and a half within the edge of the Board.

If they should lay a more than ordinary thick or thin Board at the first, they would have a greater number of Boards to work to a Level than they need, because all the rest of the Boards must be equalized in thickness to the first.

Then they lay a second Board close to the first. But before they nail it down they again try how its side agrees with the side of the first, and also how its thickness agrees with the first Board. If any part of its edge lie hollow off the edge of the first Board, they shoot off so much of the length of the Board from that hollownes towards either end, till it comply and make a close Joynt with the first. But if the edge swell in any place, they plain off that swelling till it comply as aforesaid.

If the second Board prove thicker than the first, then with the *Adz* (as aforesaid) they hew away the under side of that Board (most commonly cross the Grain, lest with the Grain the edge of the *Adz* should slip too deep into the Board) in every part of it that shall bear upon a Joynt, and so sink it to a flat superficies to comply with the first Board. If the Board be too thin, they underlay that Board upon every Joynt with a Chip, &c.

And as this second Board is laid, so are the other Boards laid, if they be well assured the Boards are dry and will not shrink: but if they doubt the driness of the Boards, they (sometimes do or should) take a little more pains; for after they have nailed down the first Board, they will measure the breadth of two other Boards, laying them by the side of the first. But yet they will not allow them their full

room.

room to lie in, but after their edges are true shot in a straight line, they will pinch them off about half a quarter of an Inch room more or less, according as they guess at the well-seasonedness of the Boards; by nailing down the fourth Board nearer to the first Board by half a quarter of an Inch (more or less) than the breadth of both Boards are. And though it be afterwards somewhat hard to get these two Boards into that narrow room, *viz.* between the first and fourth Board, yet they help themselves thus; The under-edges of these Boards that are to joyn to each other they Bevel somewhat away, and then the first and fourth Board being fast nailed down (as aforesaid) they set the outer edges of these two Boards against the two nailed Boards, letting the inner edges of the two loose Boards meet, and make an Angle perpendicular to the Floor. Then with two or three men jumping all at once upon that Angle, these two Boards with this force and reiterated jumps by degrees press flat down into the superficies of the Floor; or else with Forcing Pins and Wedges force them together: and then with Brads they nail them down, as they did the first Board. Thus afterwards they nail down a seventh Board as they did the fourth, and then fit in the fifth and sixth Boards, as they did the second and third Boards. And so on nailing down every third Board, and forcing two others between it and the last nailed Board, till the whole Floor be Boarded.

But if these Boards are not long enough (as I hinted before) to reach through the whole Room, they examine how true the ends lie in a straight line with one another, by applying the edge of the Two-foot Rule to the ends and where the ends of any Boards
keep

keep off the edge of the Two-foot Rule from complying with the whole range of ends, they with the *Chiffel* and *Mallet* cut off that irregularity, holding and guiding the *Chiffel* so that it may rather cut away more of the bottom than top of the Board, that so the Boards joynted to the ends of the first laid Boards, may make on the Superficies of the Floor the finer and truer Joynt.

Having thus Boarded the whole Room, notwithstanding they used their best diligence to do it exactly, yet may the edges of some Boards lye somewhat higher than the Board it lies next to : therefore they peruse the whole Floor, and where they find any irregularities they plane them off with the Plane, &c.

§ 19. *The Hanging of Doors, Windows, &c.*

THE Floors being Boarded, the next work is to *Hang* the *Doors*, in which though there be little difficulty, yet is there much care to be taken, that the Door open and shut well.

If the Door have a *Door-Case* (as Chamber-Doors, and Closet-Doors commonly have) the *Jaums* of the Door Case must stand exactly perpendicular, which you must try by the Plumb-line. as by § 8. and the Head of the Door Case or Entertise must be fitted exactly square to the *Jaums*, as you were taught *Numb. 5.* § 17, 18, 19. and the Angles of the Door must be made exactly square, and the *Rabbets* of the Door to fit exactly into the *Rabbets* of the Door-Case. But yet they commonly make the Door about one quarter of an inch shorter than the insides of the *Jaums* of the Door-Case, lest if the Boards of the Floor chance to swell within the sweep of the Door, the bottom

of the Door should drag upon the Floor.

They consider what sort of Hinges are properest for the Door they are to Hang. When they have a *Street-door* (which commonly is to take off and lift on) they use *Hooks* and *Hinges*. In a *Battend-door*, *Back-door*, or other *Battend-door*, or *Shop-windows*, they use *Cross-Garnets*. If a *Fram'd Door*, *Side Hinges*: And for *Cup-board Doors* and such like, *Duf-Tails*. (See the description of these Hinges in *Numb. 2. Fig. 1. 1, 6.*) But what sort of Hinges soever they use, they have care to provide them of a strength proportionable to the size and weight of the Door they hang with them. Well-made Hinges I have described *Numb. 2. fol. 20.* Whither to avoid repetition I refer you.

If they Hang a *Street-door* (which is commonly about six foot high) they first drive the *Hooks* into the *Door-Post*, by entering the Post first with an *Augure*: But the *Bit* of the *Augure*, must be less than the *Shank* of the *Hook*, and the hole boarded not so long, because the *Shank* of the *Hook* must be strongly forced into the *Augure-hole*, and should the *Augure-hole* be too wide, the *Shank* would be loose in it, and not stick strong enough in it. Therefore if the *Shank* be an *Inch square*, an *half-Inch Augure* is big enough to bore that hole with, because it will then endure the heavier blows of an *Hammer*, to drive it so far as it must go; and the stronger it is forced in, the faster the *Hook* sticks. But yet they are careful not to split the *Door-Post*.

These *Hooks* are commonly drove in about *Fifteen Inches* and an *half* above the *Ground-sell*, and as much below the top of the *Door*. It is or should be their care to chuse the *Pin* of the lower
Hook

Hook about a quarter of an Inch longer than that they use for the upper Hook (or else to make it so) because these Doors are commonly un-weildy to lift off and on, especially to lift both the Hindges on both the Hooks at once. Therefore when the lower Hindge is lifted on the lower Hook, if the Door be then lifted perpendicularly upright, so high as the under side of the upper Hindge may just reach the top of the upper Hook, you may the easier slip the Eye of the upper Hindge upon the Hook; whereas, if the lower Hook be either shorter, or just no longer than the other; instead of lifting it readily upon the upper Hook, you may lift it off the lower Hook, and so begin the labour again.

Having drove in the Hooks they set the *Rabbets* of the Door within the *Rabbets* of the Door Posts, and underlay the bottom of the Door, with a Chip or two about half a quarter of an Inch thick, to raise the Door that it Drag not. Then they put the Eyes of the Hindges over the Pins of the Hooks, and plaing the Tail piece of the Hindges parallel to the bottom and top of the Door, they so nail them upon.

This is the Rule they generally observe for Hanging Doors, Shop-windows, &c. Only, sometimes instead of Nailing the Hindges upon the Door, they *Rivet* them on, for more strength. And then, after they have fitted the Door or Window into its Rabbirs, and laid the Hindges in their proper place and position (as aforesaid) they make marks in the Nail-holes of the Hindge with the point of their Compasses upon the Door, and at those marks they Pierce-holes, with a *Piercer-Bit*, that fits the shank of the *Rivet*; then they put the shank of the

Z. 2.

Rivet

Rivet through the holes made in the Door; yet so that the Head of the River be on the outside of the Door; and they also put the end of the Shank into the Nail-hole of the Hindge, and so while another man holds the Head of the Hatchet against the Head of the River, they with the *Pen* of their *Hammer* batter and spread the flat end of the Shank over the Hole, as was shewn. Numb. 2. fol. 24, 25.

The Titles of some Books of Architecture.

S*ebastion Seirlio*, in Folio.

Hans Bloom's Five Collumns, Folio.

Vignola, in Folio.

Vignola, Or the *Compleat Architect*, in Octavo

Scamotzi, Quarto.

Palladio, Quarto.

Sir *Henry Wotton's* Elements of Architecture, Quarto.

These Books are all Printed in English: But there are many others extant in severall other Languages, of which *Vitruvius* is the chief: For from his Book the rest are generally derived; as *Philip Le Orm*, *Düsterlin*, *Marlois*, and many others, which being difficult to be had among Book-sellers, and these sufficient for information, I shall omit till another opportunity.

An Explanation of Terms used in Carpentry.

A.

A *Dz*, Plate 8. B \S 2.
Arch, Any work wrought Circular, as the top part of some Window-frames, the top of some great Gates, the Roof of Vaults, &c.

Architrave, See Numb. 6. Plate 6. i. and Plate 6.

A. \S 1.

Ax, Numb. 7. Plate 8. A.

B.

B *Ack* or *Hip molding*. The backward Hips or *Valley-Rafter* in the way of an Angle for the back part of a Building.

Bannister, Numb. 8. Plate 11. g g g.

Base is commonly the Bottom of a Column. See Numb. 6. Plate 6. b. and Plate 7. B.

Batement, To abate or waste a piece of Stuff, by forming of it to a designed purpose. Thus instead of asking how much was cut off such a piece of Stuff, Carpenters ask what *Batement* that piece of Stuff had.

Batter, the side or part of the side of a Wall, or any Timber that bulges from its bottom or foundation, is said to *Batter* or *hang over* the Foundation.

Battlement, A flat Roof or Platform to walk on. But Battlements are more properly Walls built about the Platform to inclose it, as is seen upon Towers for defence: Part of the Battlement being Breast

Breast high that Musquetiers may shoot over it, the other part Man-high, to secure Men from the shot of their enemies.

Bank, a peece of Fir unsplit, from four to ten Inches square : and of many lengths.

Bear, Timber is said to *Bear* at its whole length when neither a Brick wall or Posts &c. stand between the ends of it. But if either a Brick wall or Posts, &c. be Trimmed up to that Timber, then it is said to *Bear* only at the distance between the Brick wall or Post and either end of the Timber. Thus Carpenters ask what

Bearing such a peece of Timber has? the answer is 10, 12, 15, &c. Foot, according to the length of the whole Timber, or else according to the distance between either end of the Timber, and a

Beaver, viz. a Post or Brick wall that is Trimmed up between the two ends of a peece of Timber, to shorten its *Bearing*.

Bond, when workmen say make good Bond, they mean fasten the two or more peeces of Timber well together, either with Tennanting and Mortessing, or Duff tailing, &c.

Binding Joys, See Trimmers, or Plate 10. *b b b*.

Brace, See Plate 11. *b b b*.

Brad, is a Nail to Floor Rooms with, they are about the size of a Ten-penny Nail, but have not their heads made with a shoulder over their shank, as other Nails, but are made pretty thick towards the upper end, that the very top of it may be driven into, and buried in the Board they nail down, so that the tops of these Brads will not catch (as the Heads of Nails would) the Thrums of the Mops when the Floor is washing. You may see them at most Ironmongers.

Break

Break in, Carpenters with their Ripping Chissel do often *Break in* to Brick-walls: that is, they cut holes, but indeed more properly break the Bricks by force, and make their hole to their size and form.

Bressummer, See Plate 11. C C, D, F F, h h.

Bring up, A term most used among Carpenters, when they discourse *Bricklayers*; and then they say, *Bring up* the Foundation so high, *Bring up* such a wall, *Bring up* the Chimnies, &c. which is as much as to say, Build the Foundation so high, Build the wall; Build the Chimnies, &c.

Butment, The peece of Ground in the yard marked, G in Plate 10. is a *Butment* from the rest of the Ground-Plot.

Buttress, that stands on the outside a wall to support it.

C

C*amber*, A peece of Timber cut Arching, so as when a weight considerable, shall be set upon it, it may in length of time be reduced to a straight.

Cantilevers, Peeces of Wood framed into the Front or other sides of an House to sustain the Molding and Eaves over it.

Carcass, is (as it were) the Skelleton of an House, before it is Lath'd and Plaistered.

Cartouses, Ornamented *Corbels*.

Cleer Story Window, Windows that have no Transum in them.

Commander, See Numb. 7. Plate 8. K and § 10.

Coping over is a sort of hanging over, but not square to its upright, but Bevelled on its under side, till it end in an edge.

Corbel,

Corbel, A peece of Timber set under another peece of Timber, to discharge its Bearing.

Crab, The Engine described Plate 9. E. and B C D severall of its Appurtenances, viz. B C C *Snatch Blocks*. D *Lewers*. Its Office is to draw heavy Timber to a considerable heighth.

Crow, See Plate 8. L. Its Office is to remove heavy Timber, and therefore for strength is made of Iron.

Crown Post, See Plate 11. H. Also the *King Peece*, or *Joggle peece*.

D

D*ischarge*, A Brick-wall or a Post trim'd up to a peece of Timber over charg'd for its Bearing, is a Discharge to that Bearing.

Dormer, Plate 11. Q. R.

Double Quarter, See *Quarter*.

Draft, The Picture of an intended Building described on Paper, whereon is laid down the devised Devisions and Partitions of every Room in its due proportion to the whole Building, See Numb. 7. § 13.

Drag, A Door is said to *Drag* when either by its ill Hanging on its Hinges, or by the ill Boarding of the Room, the bottom edge of the Door rides (in its sweep) upon the Floor. See § 19.

Dragon beams are two strong Braces or Struts that stands under a Bressummer, meeting in an angle upon the shoulder of the *King peece*. In Plate 11. i i are *Dragon beams*.

Draw knife, described Plate 8. E and § 5.

Draw Pins, described Plate 8. F and § 6.

Drug, described Plate 9. E and § 12.

Enter,

E

Enter, When Tennants are put into Mortresses, they are said to Enter the Mortresses.
Enterduce or Entertise described Plate 11 C.C.

F

Featther-edge, Boards or Planks that have one edge thinner than another are called *Feather edge* stuff.

Fir Pole, A sort of stuff cut off the Fir-tree, small and long, commonly from 10 to 16 Foot. They are sometimes used in sleight Buildings, to serve instead of Bauks and Quarters.

Flyers, are Stairs made of an Oblong square Figure, whose fore and backsides are parallel to each other; and so are their ends: the second of these *Flyers* stands parrallel behind the first, the third behind the second, and so are said to fly off from one another.

Floor, In *Carpentry*, it is as well taken for the Fram'd work of Timber, as the Boarding over it.

Foot-pace, is a part of a paire of Stairs, whereon after four or six steps you arrive to a broad place, where you may take two or three paces before you ascend another step; thereby to ease the legs in ascending the rest of the steps.

Furrings, The making good of the Rafters Feet in the Cornice.

G

Gable or Gable end, in Plate 11. II K.
Gain, The bevelling shoulder of a Joyst or other

A a

ther

ther Stuff: It is used for the Lapping of the end of a Joyst &c. upon a Trimmer or Girder, and then the thickness of the shoulder is cut into the Trimmer also Bevilling upwards, that it may just receive that *Gain*, and so the Joyst and Trimmer ly even and level upon their superficies. This way of working is used in a Floor or Hearth,

Girder, described Plate 10 Q Q.

Ground Plate, described Plate 11 A.

Ground Plot, The peece of Ground a Building is to be erected upon.

H

H *Ang over*, See *Batter*.

Hips, described Plate 11. E E, They are also called *Principal Rafter*s, and *Sleepers*.

Hook-pin described Plate 8. F.

I

J *ack*, described Plate 8. M. An Engine used for the removing and commodious placing of great Timber.

Jack-Plain called so by Carpenters, but is indeed the same that Joyners call the *Fore Plain*, See Numb. 4. § 2. and Plate 4 B 1.

Jaums, Door Posts are so called: So are the upright outer Posts of a Window frame, See Plate 11. a a a a, c c, n n.

Joggle peece, See Plate 11. H.

Joysts, See Plate 10 a a a a.

Juffers, Stuff, about 4 or 5 inches square, and of several Lengths.

K

King peece, See Joggle peece.

Kerf, See Explanation of Terms in Numb. 6.

Knee, A peece of Timber growing angularly, or crooked, that is, a great Branch shooting out neer the top of the Trunk of the Tree, and is so cut that the Trunk and the Branch make an angle; as in Plate 11. E L; being made out of one peece of stuff: it is called a *Knee-peece*, or *Knee-Rafter*,

L

Landing-place, is the uppermost Step of a pair of Stairs, viz. The Floor of the Room you ascend upon.

Skirts, Projecting of the Eaves.

Level, See Plate 8. G and § 7.

Lever, See Plate 9. D.

Lintel, In Brick-Buildings Carpenters lay a long piece of Timber over the Peers, to Trim with the Window-Frame; as well to Bear the thickness of the Brick-wall above it, as to make Bond with the sides of the Walls.

Long-Plain, The same that Joiners call a *Joynter*. See Numb. 4. B 2 § 4.

Luthern, See Dormer.

M.

Modillon, See Cantelever.

Molding, Moldings are stuck upon the edges of stuff to Ornament it: As on Chilmney-pieces, the

A a 2

inner

inner edges of Window-frames, Shelves, &c. See Numb. 4. 6. 9.

Munnion, the upright Posts that divide the several Lights in a Window-frame, are called *Munnions*. See Plate 11. q q q.

N

N*ewel*, the upright Post that a pair of Window-stairs are turned about.

P

P*itch*, The Angle a Gable-end is set to, is called the *Pitch* of the Gable-end.

Planchier, An Ornament to which the Cornice is fastned.

Plate, A piece of Timber upon which some considerable weight is framed, is called a *Plate*. Hence *Ground-Plate*, Plate 11. A. *Window-Plate*, &c.

Pumb-line described, Plate 8 H & 8.

Posts, See *Principal Posts*.

Prick-Posts, Posts that are framed into *Bresssummers*, between *Principal-posts*, for the strengthening of the Carcass.

Principal-Posts, The Corner Posts of a Carcass, See Plate 11. B B.

Profile, The same with *Ground-Plot*.

Projecture, is a jetting over the upright of a Building; Thus *Balconies* project into the Street.

Puncheons, Short pieces of Timber placed under some considerable weight to support it.

Pudlies,

Pudlairs, Pieces of Stuff to do the Office of Hand-Spikes.

Purlins, See Plate 11. N N.

Q.

Quarters are *single* and *double*. *Single Quarters* are Sawen stuff, Two Inches thick, and Four inches broad. The *Double-Quarters* are sawen to Four Inches square.

Quartering, In the Front of the third Story in Plate 11. All the Work except the Principal Posts, Jaums, and Window-frames, *viz.* The upright Trimming and the Braces is called *Quartering*.

Quirk, A piece taken out of any regular Ground-plot, or Floor: For example, The whole Ground-plot A B C D. in Plate 10 is a regular Ground-plot. But if the piece K be taken out of it, K shall be a *Quirk*.

R.

Rafter, See Plate 11. c c c c.

Rail, Rails stand over and under Bannisters of *Balconies*, Stair-Cases, &c.

Raiser, is a Board set on edge under the Foreside of a step.

Raising-piece, Pieces that lye under the Beams upon Brick or Timber by the sides of the House.

Relish, See *Projecture*.

Return, Either of the adjoyning sides of the Front of an House or Ground-plot, is called a *Return-side*, as in Plate 10. the Front is A B, the *Return-sides* to this Front is A C and B D,

Ridge.

Ridge, the meeting of the Rafters on both sides the House is called the *Ridge*.

Ripping Chissel, See Plate 8 D & 4.

Roof, The Covering of a House; But the word is used in Carpentry for the Timber work of the Covering.

S*cribe*, See Number 6. in *Explanation of Terms*.
Shake, Such Stuff as is crackt either with the heat of the Sun or the droughth of the wind, is called *Shaken Stuff*.

Shingles, Smal pceces of wood used to cover Houses with, instead of Tiles or Slates.

Shreadings, See Plate 11. the lower end of the Principal Rafters markt *rr* are called *Shreadings*, or *Furrings*.

Sleepers, The same with *Purlins*.

Snatch-blocks, See Plate 9 B C C.

Socket Chissel, Described Plate 8 and § 3.

Soils or *Sells*, are either *Ground Sells* described Plate 11. A. or *Window Sells* which are the bottom Pceces of Window Frames.

Stair Case, The inclosure of a pair of Stairs, whether it be with Walls, or with Walls and Railes and Bannisters, &c.

Stancheons, See *Puncheons*.

Strut, See *Dragon beam*.

Summer, In Plate 10. P P is a *Summer*, whereinto the Girders are Tennanted.

T

T*enfoot Rod*, See § 13.

Transom, The Pcece that is framd a cross a double.

ble Light Window, See Plate II. P P.

Trim, When workmen fit a peece into other work, they say they *Trim* in a peece.

Trimmers, See Plate IO *b b b b*.

Truss, See *King peece*, or *Joggle peece*.

Tusk, A Bevel shoulder, made to strengthen the Tennant of a Joynt, which is let into the Girder.

V

V *Alley Rafter*, See *Back* or *Hip Molding*.

W

W *Ell hole*, See Plate IO. I.

Wall Plate, In Plate IO. A C, B D and N O are *Wall Plates*.

Thus much of *Carpentry*. The next *Exercises* will (God Willing) be upon the Art of *Turning*, *Soft Wood*, *Hard Wood*, *Ivory*, *Brass*, *Iron*, &c. With several Inventions of *Oval work*, *Rose work*, *Rake work*, *Angular work*, &c.

F I N I S.

March 19

Dear Sir,
I have the honor to acknowledge the receipt of your letter of the 14th inst. in relation to the matter of the
Tennant's estate, which is now before the Court.
I am, Sir, very respectfully,
Your obedient servant,
J. H. [Signature]

Very respectfully,
J. H. [Signature]

Wm. [Signature]
[Address]

I have the honor to acknowledge the receipt of your letter of the 14th inst. in relation to the matter of the
Tennant's estate, which is now before the Court.
I am, Sir, very respectfully,
Your obedient servant,
J. H. [Signature]

FINIS

Numb. X.
MECHANICK
EXERCISES,
OR
The Doctrine of
Handy-Works.

Applied to the Art of *T U R N I N G*.

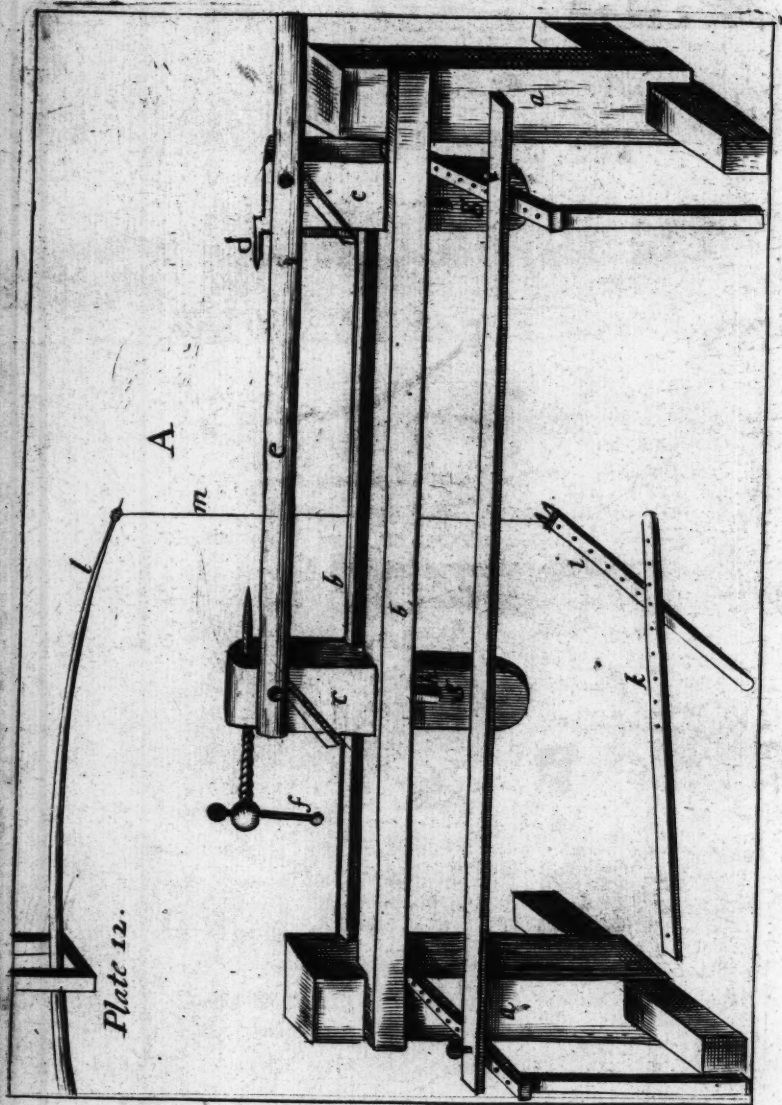
By *Joseph Moxon*, Member of the *Royal Society*, and *Hydrographer* to the
Kings most Excellent Majesty.



L O N D O N,

Printed for *Joseph Moxon* at the Sign of *Atlas* on *Ludgate-Hill*, 1680.

Plate 12.



MECHANICK EXERCISES,

O R,

The Doctrine of

Handy-works,

Applied to the Art of TURNING.

Of Turning.

AS by placing one Foot of a pair of Compasses on a Plain, and moving about the other Foot or point, describes on that Plain a Circle with the moving point; so any Substance, be it *Wood, Ivory, Brass, &c.* pitcht steddy upon two points (as on an *Axis*) and moved about on that *Axis*, also describes a Circle Concentrick to the *Axis*: And an Edg-Tool set steddy to that part of the outside of the aforesaid Substance that is nearest the *Axis*, will in a Circumvolution of that Substance, cut off all the parts of Substance that lies farther off the *Axis*, and make the outside of that Substance also Concentrick to the *Axis*. This is a Brief Collection, and indeed the whole Sum of *Turning*.

Now, as there is different Matter or Substance to be *Turned*, so there is also different Ways, and different Tools to be used in *Turning* each different Matter.

B b

The

The different Matters are *Soft Wood, Hard Wood, Ivory, Brasi, Iron, &c.* each of which (when I have described the Turners Tools for Soft Wood) I shall discourse upon. But,

§ I. Of the Lathe.

THE *Lathe* is described in *Plate 12. A.* This Machine is so vulgarly known, that though it cannot be described in *Draft*, so as all its parts shall appear at one single View, yet enough of it to give you the Names of its several Members, and their Uses are represented: viz.

a a a a The *Legs* or *Stiles*.

b b The *Cheeks* or *Sides*.

c c The *Puppets*.

d The *Screw*.

d The *Pike*.

e The *Rest*.

f The *Handle of the Screw*.

g The *Tennants of the Puppets*.

h The *Wedge*.

i The *Treadle*.

k The *Cross-Treadle*.

l The *Pole*.

m The *String*.

n The *Horn*.

¶ I. Of the Legs, or Stiles.

THE *Legs* or *Stiles* are commonly about two Foot and ten Inches high, and are set perpendicularly upright; having each of them a *Tennant* on its upper end, of the thickness the two *Cheeks* are
to

to stand asunder : And on either side the Shoulder of these two *Tennants* is laid one of the *Cheeks* close to the sides of the *Tennants*, and so pinned close to the *Tennants* as was taught Numb. 5. §. 17. But a steddier and more secure way, is to have a strong Iron Screw made with a square Shank near the Head, that when it enters into a square hole made fit to it in the hithermost *Cheek*, it may not twist about, but by the Turning about of an Iron Nut, upon the fore end of the Screw, the Nut shall draw the two *Cheeks* close to the two sides of the *Tennants*, or the upper ends of the *Legs*.

¶ 2. Of the Cheeks.

AS I told you, the *Legs* are to be set up directly perpendicular, so the *Cheeks* are to be fastened directly Horizontally upon them: And the *Legs* and *Cheeks* are to be fastned with *Braces* to the Floor and other parts of the Room the *Lathe* stands in, according to the convenience of the Room for fastning, that the whole *Lathe* may stand as steddly and solid as may be. For if with *Turning* large Work the strength of the Tread should make the *Lathe* tremble, you will not be able to make true and neat Work; but the Tool will job into softer parts of the Stuff, and fly off where a Knot or other harder parts of the Stuff comes to the Tool.

¶ 3. Of the Puppets.

THE *Puppets* are square pieces of Wood, of a Substance convenient to the light or heavy work they intend to Turn : And *Turners* will rather

have their *Puppets* too strong than too weak; because, though the *Puppets* be very strong, yet they can turn light work with them; whereas if they be weak they cannot turn Heavy work with them: For the weight of heavy unequal tempered Stuff running about, will be apt both to shake the *Puppets*, and loosen the small hold of the *Wedge* in the *Tennant*; by either of which Inconveniencies the Work in the *Lathe* may tremble, as aforesaid.

And though no size for the height of the *Puppets* can be well asserted, because of the several Diameters of Work to be Turned, yet Workmen generally covet to have their *Puppets* as short as they well can, to bear their Work off the *Cheeks* of the *Lathe*, because these *Puppets* stand the firmer, and are less subject to loosen. But then, if the Diameters of the work be large, the *Puppets* may be too short to Turn that work in: For the *Pikes* of the *Puppets* must stand somewhat more than half the Diameter of the Work above the superficies of the *Cheeks*. Therefore *Turners* have commonly two or three pair of *Puppets* to fit one *Lathe*, and always strive to use the shortest they can to serve their Work, unless the shortness of the *Leggs* of the *Lathe*, makes the work fall too low for the pitch of the Workman that is to work at the *Lathe*. Therefore in the making of the *Lathe* the height of the *Legs* with relation to the intended work, and height of the Workman, are to be well considered.

At the lower end of these *Puppets* are made two *Tennants*, of such a thickness, that they may easily slide in the *Groove* between the two *Cheeks*, and so long, that a *Mortise* through it of the length of the *Cheeks* depth, and a sufficient strength of Wood below

low it may be contained. Into this *Mortess* is fitted a *Tapering-Wedge*, somewhat less at the fore end and bigger at the hinder end than the *Mortess*, that as it is forced into the *Mortess* with a *Mallet* or a *Maul*, it may draw the bottom Shoulder of the *Puppet* close and firmly down upon the *Cheeks*, that they may neither joggle or tremble in working.

¶ 4. Of the Horn.

UPon the Right Hand *Puppet* on the out side near the top of it, is hung the Tip-end of an *Horn* with its Tip downwards, to hold Oyl in, and ought to have a Wooden round *Cover* to fit into it, that neither Chips or Dirt get in to spoil the Oyl; and in the handle of the *Cover* should be fitted a wooden *Button*, which may serve for an *Handle* to the *Cover*: And through this *Button* should be fastened an Iron *Wyer* to reach almost to the bottom of the *Horn*: This *Wyer* stands always in the Oyl, that so oft as the Workman has occasion to oyl the Centers of his Work, to make his work slip about the easier, he takes the wooden *Cover* by the *Button*, *Wyer* and all, and with the end of the *Wyer* Oyls his Center-holes, and pops his *Wyer* and *Cover* again into the *Horn* against he has occasion to use it the next time.

¶ 5. Of the Pikes and Screw.

Near the upper end of one of these *Puppets* is fastened a strong Iron *Pike*, but its point is made of tempered Steel; and near the upper end of the other *Puppet* is fitted an Iron *Screw* quite through a

B b 3

Nut

Nut in the *Puppet*, whose point is also made of Temper'd Steel. This *Iron Pike* in one *Puppet*, and the *Screw* in the other *Puppet* are so fitted into the *Puppets*, that their *Shanks* lie in a straight *Line* with one another, and both their points lie also in that straight *Line* pointing to one another: And in the *Head* of the *Iron Screw* is a *Hole* where-into is fitted an *Iron Handle* about seven or eight *Inches* long, with a round *Knob* at each end of it that it slip not through the hole in the *Head*. This *Iron Handle* is to turn about the *Screw* forward or backward as your purpose shall require.

Upon the points of this *Screw* and *Pike* the *Centers* of the *Work* are pitcht, and afterwards screw'd with the *Screw* hard, and so far into the *Stuff*, that it may not slip off the points in working, especially if it be soft *Wood*, and the work large and heavy.

Also, near the upper end of these *Puppets*, upon that side the *Workman* stands when he works, the *Wood* of the *Puppets* is wrought away to square flat *shoulders* somewhat below the *Pikes*, that the *Rest* may (if occasion be) lie near the *Pikes*, and bear steady upon the *Shoulders*.

¶ 6. Of the Rest.

THE *Rest* is a square piece of *Stuff* about an *Inch* or an *Inch* and half thick, and two *Inches*, or two and an half broad, and somewhat longer than the distance between the *Puppets*. Its *Office* is to rest the *Tool* upon, that it may lie in a steady position while the *Workman* uses it.

¶ 7. Of

¶ 7. Of the Side-Rest.

BUT besides this *Rest*, *Turners* have another *Rest* called the *Side-Rest*. This they use when they *Turn* the flat sides of Boards; because the flat sides of Boards standing athwart the *Pikes*, and this *Rest* standing also athwart the *Pikes*, they can the more conveniently rest their Tool upon it. It is marked e in Plate 13, and is in the Plate disjunct from the *Lathe*; as well because it and the Common *Rest* cannot both together be exprest in Picture, as also because it is made to take off and put on as occasion requires.

The *Rest* is marked *a*, and is a piece of an Oaken planck or Elm plank, about two Inches thick, and stands so high above the *Cheeks* of the *Lathe* as the *points* of the *Pikes* do, or sometimes a little higher: Its Breadth is about a Foot or more or less, as the Work requires, or the Workman fancies. The Bottom of it is firmly nailed to one side of a Quarter of Oak or Elm of about three Inches square, and two Foot, or two Foot and an half long, close to one end, as you see in the Figure at *b*, so as the *Rest* stand upright to the piece of Quarter. This piece of Quarter is as a *Tennant* to slide into a square Iron Collar marked *c*; This square Iron Collar is made so long as to reach through the depth of the *Cheeks* of the *Lathe*, and to receive the Quarter or *Tennant* thrust through it above the *Cheeks*, and a *Wedge* under the *Cheeks* marked *d*, which *Wedge* (when stiff knock'd up) draws the *Tennant* strong and firmly down to the *Cheeks*, and consequently keeps the *Side-rest* steady on any part of the *Cheeks*, according

ding as you slide the *Collar* forwards or backwards towards either *Pike*, or as you thrust the *Rest* nearer or farther to and from the *Pikes*.

Some *Turners* for some Work, instead of a plank for this *Rest*, fasten to one end of the *Quarter* or *Tenant*, a long Iron with a round Cilindrick *Socket* in it, as at the Figure marked *f* in *Plate 13*, *a* is the *Socket* of about an Inch or an Inch and an half Diameter, to reach within two or three Inches as high as the *Pikes*, and into this *Socket* they put a long round Iron *Shank*, as in Figure *g* of the same *Plate*, *a* is the *Shank*, and at the top of this *Shank* is made the *Rest*, marked *b*. This *Shanck* (I say) slips easily into the *Socket*, that it may be raised or let down as occasion requires, and by the help of a *Screw* through the *Socket* at *e*, may be fastned at that length.

The *Rest*, (by reason of its round *Shank*) may be also turned with its upper edge more or less oblique or athwart the Work, or else parallel to the Work, according as the purpose may require.

Near one end of the *Rest* is fitted and fastned a piece of Wood about an Inch square, and ten or twelve Inches long: This piece of wood is fitted stiff into a square Hole or Mortise made in the *Puppet*, a little above the *Shoulder* for the *Rest*, to set the *Rest* to any distance from the *Pikes*, which, with the ends of wooden *Screws* entred into wooden *Nuts* on the further side of the *Puppet*, and coming through against the *Rest*, keeps the *Rest* from being thrust nearer to the work when the Workman is working.

18. Of the Treddle and Cross-Tredden.

ABout the middle between the ends, is placed a wooden *Tredden*, about two Inches and an half broad, an Inch thick, and three Foot long, and sometimes three and an half, to four Foot long. The hinder end of it is fastned to the Floor, with a piece of Leather (sometimes a piece of the Upper-leather of an old Shoe, which piece of Leather is nailed to the under-side of the hinder end of the *Tredden*, so as to leave Leather enough beyond the end of the *Tredden* to nail down upon the Floor; which *Tredden* being thus nailed down, will move upwards, as the Spring of the *Pole* draws up the *String*; the *String* being also fastned to the fore-end of the *Tredden*.

The hinder end of the *Tredden* is nailed down about a Foot or a Foot and an half behind the *Lathe*, and about the middle between both the *Legs*, so that the fore-end of the *Tredden* reaches beyond the fore-side of the *Lathe*, about a Foot and an half or two Foot. And note, that the farther the Fore-end of the *Tredden* reaches out beyond the Fore-side of the *Lathe*, the greater will the sweep of the Fore-end of the *Tredden* be, and consequently it will draw the more *String* down; and the more *String* comes down at one *Tread*, the more Revolutions of the Work is made at one *Tread*, and therefore it makes the greater rid-dance of the Work.

But then again, if the Fore-end of the *Tredden* reach too far before the Fore-side of the *Lathe*, it may draw the end of the *Pole* so low as to break it: and it will also be the harder to *Tread* down, because the power commanding (which is the weight of the

C c

Tread)

Tread) lies so far from the weight to be commanded, which is the strength of the *Pole*, augmented by the distance that the end of the *Treddle* hath from the Work in the *Lathe*; so that you may see, that the nearer the Fore-end of the *Treddle* lies to the Perpendicular of the Work in the *Lathe*, the easier the *Tread* will be: And some *Turners* that *Turn* altogether Small Work, have the Fore-end of the *Treddle* placed just under their work; so that their *String* works between the *Cheeks* of the *Lathe*; But then the Sweep of the *Treddle* being so small, the *Pole* draws up but a small length of *String*, and consequently makes the fewer Revolutions of the Work in one *Tread*, which hinders the riddance of the Work: unless with every Spring of the *Pole*, they should lift their Treading Leg so high as to tire it quickly with bringing it down again, after it is raised to so uncommodious a position.

This *Treddle* hath a square Notch in the middle of the further end, about an Inch and an half wide, and two Inches long, that the end of the *String* may be wound either off or on the Wood on either side the Notch, to lengthen or shorten the *String*, as the different Diameters of the Work shall require.

About the middle of the *Treddle* is fixed a round Iron *Pin* about half an Inch in Diameter; so as to stand upright about an Inch and an half or two Inches long above the *Treddle*. And under the *Cheeks* is also fixed down the *Cross-Treddle*, which is such another piece of Wood as the *Treddle* is, but longer or shorter, according to the length of the *Lathe*: And in the middle of the Breadth of the *Cross-Treddle* is made several holes all arow to receive the Iron *Pin* set upright in the *Treddle*. These holes are commonly

ly boarded about two or three Inches assunder, that the Pin on the Treadle may be put into any one of them, according as the String is to be placed nearer to or further off either end of the Lathe.

¶ 9. Of the Pole.

THE Pole is commonly made of a Fir-pole, and is longer or shorter, or bigger or smaller, according to the weight of the Work the Workman designs to Turn: For the thicker the Pole is, the harder must the Tread be to bring it down; and for this reason, if the Pole prove too strong for their common or continued Work, they will weaken it by cutting away (with a Draw-knife, described Numb. 7. Plate 8. E, and § 5.) part of the substance off the upper and under side of the Pole.

The thick end of this Pole is nailed (or indeed rather pinned) up to some Girder or other Timber in the Ceiling of the Room, with one single Nail, or a Pin, that the Pole may move upon that Nail or Pin, as on a Center, and its thin end pass from one Paper to the other, as the Work may require. And at about a Foot distance or more, is also nailed up to some Joists or other Timbers of the Ceiling, two Cheeks of a convenient strength, and at the lower end of these two Cheeks is nailed a Quarter or Batten to bear the Pole, though the weight of a Tread be added to it, as you may see at *u u* in Plate 12.

¶ 10. Of the Side-Rest.

BUT it sometimes happens that the Ceiling of the Work-room is not high enough for the Pole to play

play upwards and downwards. Therefore in such case, they place the thin end of the *Pole* at some considerable distance off the *Lathe*, either before or behind it, and so make the Spring of the *Pole* Horizontal towards the *Lathe*, conveying and guiding the *String* from the *Pole* to the *Work* by throwing it over a *Rowler*, moving on two Iron *Center-pins* fastned at both ends, and placed parallel to the *Cheeks* of the *Lathe*, above the *Work* as high as they can; and thus every *Tread* draws the *Rowler* about. But should the *Rowler* not move about upon these Iron *Pins*, the *String* every *Tread* would both cut a Groove in the *Ruler*, and fret it self more or less upon the *Rowler*.

§ 11. Of the Bow

SOME Turners that work light Work, such as *Cane-Heads*, *Ink-horns*, &c. for which they need scarce remove the *Puppets* off their *Lathe*, use a Common *Bow*, such as Archers use. The middle of this *Bow* they fasten over Head, with its *String* Horizontally downwards, and in the middle of that *String* they fasten another *String* perpendicularly downwards, whose other end they fasten to the *Treddie*, and the *String* wound round their *Work* brings it about.

§ 12. Of the Great Wheel.

BUT when Turners work Heavy Work, such as the *Pole* and *Tread* will not command, they use the *Great Wheel*. This *Wheel* is so commonly known, that I shall need give you no other description of it than the Figure it self, which you may see in Plate 14. a. It is turned about with one, and sometimes with

with two Iron *Handles*, according as the weight of the Work may require.

Its *String* hath both its ends strong and neatly fastened together, not with a *Knot*, but lapt over one another about three Inches in length, and so is firmly whipt about with small *Gut*, that it may the easier pass over the narrow *Groove* in the edge of the *Roller*. This *String* is laid in the *Groove* made on the edge of the *Wheel*, and also in the *Groove* of the *Work*. But before it is laid upon both, one part of the *String* is lapt over and crosses the other, and the *String* receives the Form of a *Figure of 8* (only one of its *Bows* or *Circles* becomes no bigger than the *Groove* in the *Work*, and the other as big as the *Groove* in the *Wheels*.)

Then the whole *Frame* wherein the *Wheel* is fixed is removed farther off the *Lathe*, that the *String* may draw tight upon the *Work*.

The reason why the *String* thus crosses it self, is, because it will touch and gird more upon the *Groove* of the *Work*, and consequently (as was said before ¶ 14.) will the better command the *Work* about.

The manner of Turning this *Wheel*, is as the manner of Turning other *Wheels* with *Handles*.

Besides, the commanding *Heavy Work* about, the *Wheel* rids *Work* faster off than the *Pole* can do: because the springing up of the *Pole* makes an intermission in the running about of the *Work*, but with the *Wheel* the *Work* runs always the same way; so that the *Tool* need never be off it, unless it be to examine the *Work* as it is doing.

When the *Wheel* is used, its *Edge* stands athwart the *Cheeks* of the *Lathe*.

¶ 13. Of the Tredde-Wheel.

THis is a *Wheel* made of a round Board of about two Foot and an half Diameter, conveniently to stand under the *Cheek* of the *Lathe*. It also hath a *Groove* on its Edge for the *String* to run in; it hath an Iron *Axis* with a *Crook* or *Cranch* at one end: And on this *Crook* is slipt the Noose of a *Leather Thong*, which having its other end fastned to a *Tredde*, does, by keeping exact time in *Treads*, carry it swiftly about without intermission.

But the length of the *Thong* must be so fitted, that when the *Wheel* stands still, and the *Crook* at the end of the *Axis* hangs downwards, (the end of the *Tredde* to which the *Thong* is fastned may hang about two or three Inches off the Ground: For then, giving the *Wheel* a small turn with the Hand, till the *Crook* rises to the highest, and passes a little beyond it, if just then (I say) the Workman gives a quick *Tread* upon the *Tredde* to bring the *Crook* down again with a jerk, that *Tread* will set it in a motion for several revolutions, and then if he observes to make his next *Tread* just when the *Crook* comes about again to the same position, it will continue the motion, and cause of the motion, and keep the *Wheel* always running the same way, if he punctually times his *Treads*.

The *Tredde Wheel* is used for small work only, as not having strength enough to carry heavy Work about, such as *Cane-Heads*, *Small Boxes*, &c. and it is fitted below the *Cheek* between the *Puppets*, as the *Bow* is above.

Besides these Inventions to carry about the Work in the *Lathe*, there are many more; as with a great
Iron

Iron Wheel, having Teeth on its edge, which Teeth are to fall into an *Iron Nut* upon an *Iron Axis*, pitcht upon the *Pikes* of the *Puppets* of the *Lathe*, or fitted into *Collars*, &c.

Also, for very Heavy Work, as Guns, Great Mortars, &c. *Wheels* Turn'd with *Wind*, *Water* or *Horses*, to carry the Work about. Of which more in their proper places.

¶ 14. Of the String.

UPon the thin end of the *Pole* is wound a considerable Bundle of *String*, That as a *Mandrel* requires to be bigger than ordinary, or the Work heavier, they may unwind so much of the *String* as will compass the *Mandrel* twice, or (if the Work be heavy) thrice; the easier to carry it about.

This *String* is made of the Guts of Beasts (most commonly of Sheep, and spun round of several thick-nesses; of which the Workman chuses such sizes as are aptest for his Work, for large and heavy Work very thick, but for small and light work thin: And there are several reasons for his Choice; For a thin *String* will be too weak for heavy Work; but if it were not too weak for heavy work, it would be apt to mark soft wood more than a thick *String* would, when they are forc'd to shift the *String*, and let it run upon the Work. Besides, a thin *String* (though it were strong enough) would not so well bring heavy Work about; because being small, but little of the *String* touches the wood to command it, unless they wind it the often about the Work, which both takes up time, and hazards the breaking of the *String*, by the fretting of the several twists against one another.

Now

Now a thick *String* is uncommodious for small work; because having a strength and stubbornness proportionable to its size, it will not comply closely to a piece of Work of small Diameter, but will be apt to slip about it, unless both *Pole* and *Tread* be very strong; and then, if the Center-holes be not very deep, and the *Pikes* fill them not very tight, and the *Puppets* also not very well fixt, the Strength of the *String* will alter the Center-holes; especially, when the work is upon soft Wood, or else it will endanger the breaking the Work in its weakest place.

¶ 15. Of the Seat.

PARALLEL to the *Cheeks* on the inside the *Lathe* is fitted a *Seat*, about two and an half Inches square, and the whole length of the *Lathe*; having an Iron *Pin* fastned on either end the underside of it: It lies upon two *Bearers* of wood, that are fastned athwart the outer sides the *Legs*, (or else to set it higher) the outer ends of the *Cheeks*, according to the height of the person that works at the *Lathe*. These *Bearers* reach in length so far inwards, as that they may be capable to bear the *Seat* so far off from the *Lathe*, as is the Diameter of the Work they intend to Turn in the *Lathe*, and also the bulk of the Workman that stands between the *Lathe* and it, may be contained.

It is not called a *Seat* because it is so; but because the Workman places the upper part of his Buttocks against it, that he may stand the steddier to his Work, and consequently guide his Foot the firmer, and exacter.

The

The two *Bearers* have several Holes made in them, from within sixteen Inches off the *Lathe*, to the ends of them, that the Iron *Pins* fastned in the ends of the *Seat*, may be removed nearer or farther off the *Lathe*, according to the greatness or smallness of the Diameter of their Work.

Having thus described the parts of a Common *Lathe*, I shall now follow with their other Tools also.

§ II. Of Gouges,

Gouges are marked B E in Plate 15. They do the Office of *Fore-plains* in *Joyner*, and the *Jack-plains* in *Carpentry*, and serve only to take off the Irregularities the *Hatchet*, or sometimes the *Draw-knife* leaves, after the work is hewed or drawn pretty near a Round with either of them: And therefore as the *Fore-plain* is made with a Corner-edge, only to take off the Irregularities of a Board, so the *Gouge*, that it may also take off the Irregularities or Extuberancies that lie farthest from the *Axis* of the Work, and also frame pretty near the hollow Moldings required in the Work, precede the *Smoothing-Chissels*. And that the *Gouge* may the more commodiously and effectually do it, the Blade of this Tool is formed about half round to an edge, and the two extream ends of this half round a little sloped off towards the middle of it, that a small part about the middle may the easier cut off the prominencies that are not concentrick to the *Axis*, and so bring the Work into a Method of Formation.

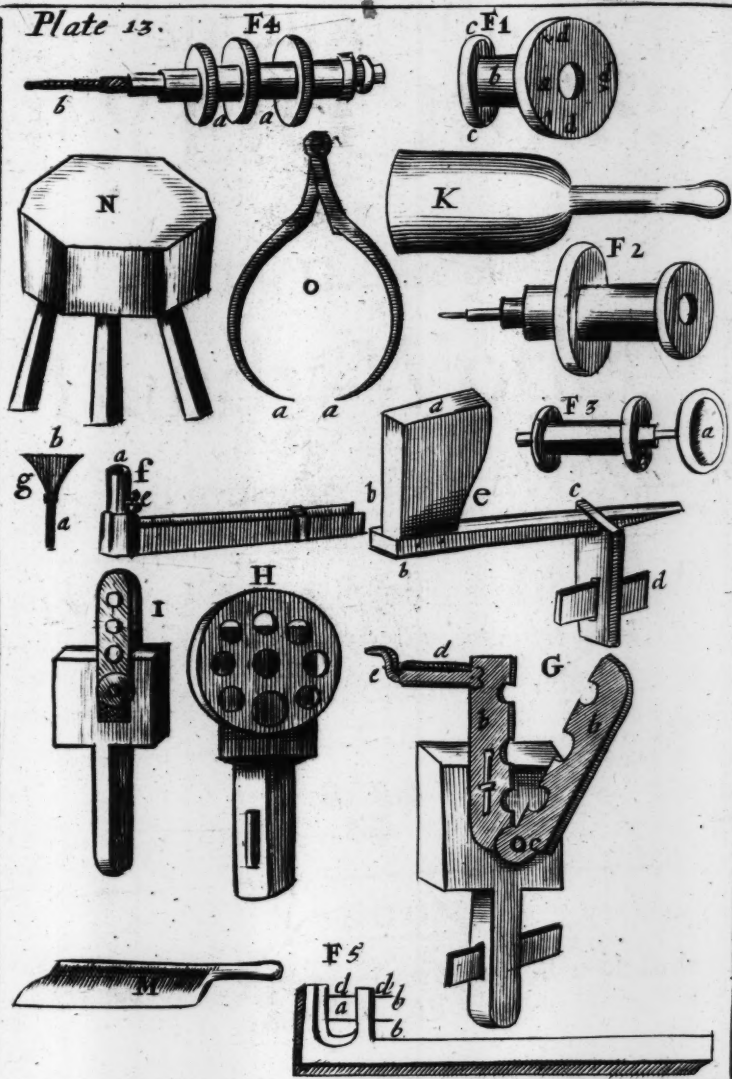
The hollow edge is ground upon the Corner of a *Grind-stone*, which in short time wears the out-side of that Corner to comply and form with the hollow

of the *Gonge*. It is afterwards Set upon a round *Whetstone*, that fits the hollow of the edge, or is somewhat less. But they do not Set their *Gonges* or *Chissels* as (I told you in Numb. 4. § 10.) the Joyners do; for *Turners Tools* being somewhat unweldy, by reason of their size, and long Handles, they lay the *Blade* of the *Gonge* with its convex side upon the *Rest* of the *Lathe*; and so with the *Whetstone* in their right hand they rub upon the *Basil* the *Grindstone* made, and as they rub, they often turn another part of the hollow of the edge to bear upon the round of the *Whetstone*, till they have with the *Whetstone* taken off the roughness of the *Grindstone*.

Of these *Gonges* there are several sizes, viz. from a quarter of an Inch to an whole Inch, and sometimes for very large Work two Inches over.

The *Handles* to these *Gonges* (and indeed to all other *Turning Tools*) are not made as the *Handles* of *Joyners* or *Carpenters Tools* are, but tapering towards the end, and so long that the *Handle* may reach (when they use it) under the Arm-pit of the Workman, that he may have more stay and steady management of the *Tool*.

Plate 13.



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Numb XL
MECHANICK
EXERCISES,

OR
The Doctrine of
Handy-Works.

Applied to the Art of TURNING.

By *Joseph Moxon*, Member of the *Royal Society*, and *Hydrographer* to the
Kings most Excellent Majesty.



LONDON,

Printed for *Joseph Moxon* at the Sign of *Aslas* on *Ludgate-Hill*, 1680.

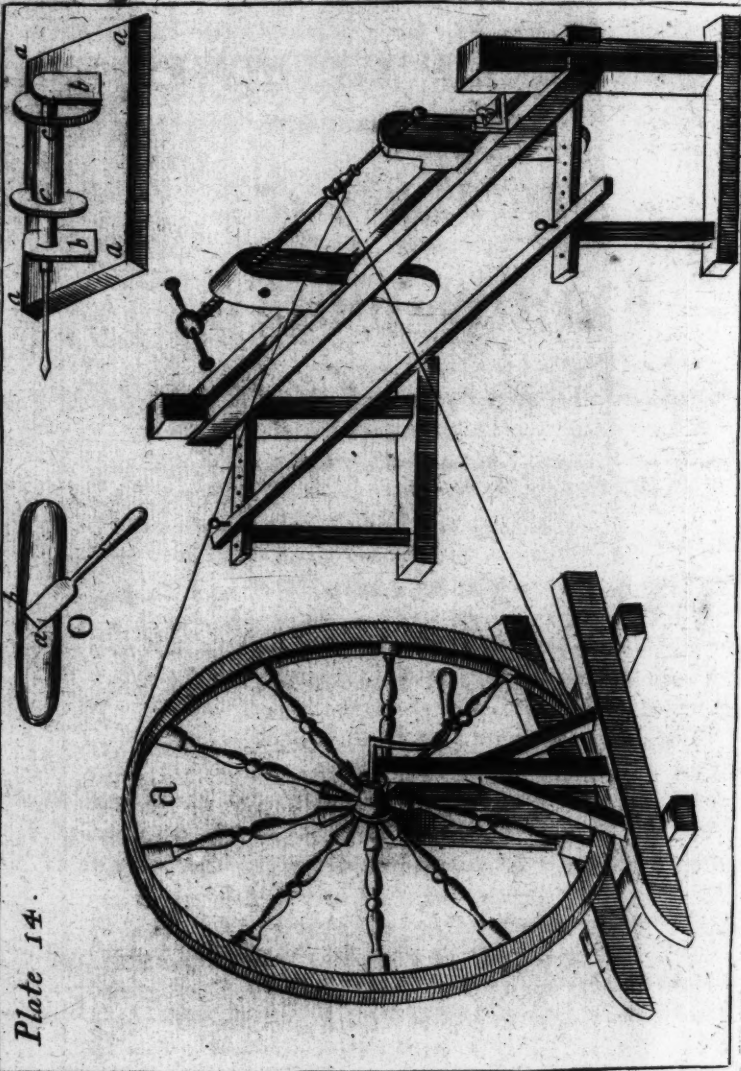


Plate 14.

MECHANICK EXERCISES,

O R,

The Doctrine of

Handy-works,

Applied to the Art of TURNING.

§ III. Of Flat Chissels.

THE *Flat Chissels* are marked CC in Plate 15. These do the office of *Smoothing Plains* in *Joining* and *Carpentry*: for coming after the *Gonges* they cut off the prominent *Risings* that the *Gonges* leave above the hollow.

The edges of these *Flat Chissels* are not ground to such a *Basil* as the *Joiners Chissels* are, which are made on one of the *Flat sides* of the *Chissels*; But are *Basil'd* away on both the *flat sides*; so that the edge lies between both the *sides* in the middle of the *Tool*: And therefore either side of the *Tool* may indifferently be applied to the *Work*; which could not well be, should the edge lie on one of the *sides* of the *Tool*: Because, if they should apply the *Basil side* of the *Tool* to the *Work*, the thickness of the *Basil* would bear the edge of the *Tool* off: And should they apply that side of
the

the *Tool* the edge lies on to the *Work*, the swift coming about of the *Work* would (where a small irregularity of *Stuff* should happen) draw or job the sudden edge into the *Stuff*, and so dawd it; which if the *Stuff* be already small enough, would now be too small; because in *Turning*, all Irregularities must be wrought smooth down.

Of those *Flat Chissels* there are several sizes, viz. from a quarter of an Inch, one Inch, two Inches, to three Inches broad, according to the largeness of the *Work*.

These are Set with the *Whetstone* as the *Gonges* are, only they often turn the *Gonges* upon the round side, because they would smoothen all the hollow edge; but these are laid flat upon the *Rest*, and with a flat *Whetstone* rubbed on the *Basils*, as the *Gonge* was with the *Round*.

§ IV. Of Hooks.

THe *Hook* is marked D in *Plate 15*. As the *Gonge* is used when the *Work* lies before the *Workman*, viz. parallel to its *Axis*, and cuts right forwards, so the *Hook* is used when the *Work* stands on the right or left side the *Workman*, as the flat sides of *Boards* to be *Turned* do; and therefore this work may be said to lie athwart its *Axis*: and the *Hook* is made so as to cut on the right or left side a *Board*, and to tak off the extuberancies from the plain of the *Board*. But though this *Tool* does the Office of a *Gonge*, yet it is more difficult for a *Workman* to use than a *Gonge*; because it is made thinner and slenderer than a *Gonge*, that its *Edge* cutting at a greater Bearing from the *Rest*, may the easier come at the *Stuff*

Stuff it works upon, and the farther the Edge that cuts lies from the *Rest*, the more difficult it is for a Workman to guide it; because it is then more subject to tremble; especially since (as aforesaid) the Edge of the *Hook* is and must be thinner than the Edge of the *Gouge*.

These *Tools*, as also the *Gouges* and *Flat Chissels*, are all about ten or twelve Inches long without the Handles.

The *Hooks* when they want sharpening cannot be ground as the *Gouges* and *Chissels* are; but they must be first sofin'd in the Fire and turned straight, and then brought to an Edge, and by heating again red hot turned into its form: Then must it be hardned and tempered as you were taught *Numb. 3. fol. 57, 58*. Yet do not Workmen proceed thus with their *Hook* every time it grows bluntish, but only when the Edge is either by long use or bad Temper grown so thick, that this following way will not help them: For they *Whet* the outer Edge with a *Whetstone* as they do other *Tools*. But because they cannot come at the inner Edge of the *Hook* with a *Whetstone*, unless the *Hook* be very wide, and the *Whetstone* very thin, they make use of a piece of Temper'd Steel, as sometimes the thin side of a *Chissel*, or the back of a Knife, and so with the Edge of the Square, scrape along the hollow Edge of the *Hook*, and force the Edge as much to the outside of the *Hook* as they can. Thus *Butchers* wear at their Girdles small round Rods of Steel well Tempered and polish'd, that they may with quick dispatch whet their Knives upon it, by forcing the Edge forwards upon the Blade, or pressing down the Shoulder that hinders the Edges Entrance: For their Steels being so well polish'd, cannot properly be

said to wear away any part of the Shoulder that should hinder the Edge from doing its Office.

§ V. Of Grooving Hooks, and Grooving Tools.

THe *Grooving Hook* is marked E in *Plate 15*, and hath its *Tooth* of different forms, according to the Fashion of the *Groove* to be made on the *Plain* of the Board; For sometimes its *Tooth* hath a *Flat Edge*, sometimes a *round Edge*, sometimes a *point only*, and sometimes *two points*, or other *Forms* as aforesaid.

Its whole *Blade* is made much stronger than the *Gouge* and *Chissels*, and hath the sides of its *Edge* more obtuse to make it the stronger.

The *Flat Tools* work the *Boards Flat* either to the *Plain* of the Board, or to a *Flat Groove* in the Board.

The *Round Edge* cuts an half round hollow in the Board.

The *Point* cuts a fine *Hollow Circle* or *Swage* in the *Flat* of the Board; and being made *Triangular*, hath three *Edges*, each of which cuts the *Ridges* smooth down that the *Hook* left upon the Board.

The *two Point Grooving Hook* cuts two fine *Hollow Circles* or *Swages* on the *Plain* of the Board.

The *Grooving Hooks* do not work as the *Hooks* do; For the *Hooks* cut the *Wood*; but these do but indeed scrape off the *Extuberancies*, or fret into the *Wood*, and therefore they are very seldom used to *Soft Wood*, because its being loose, will not endure scraping without leaving a roughness upon the *Work*; But *Hard Wood* or *Ivory* (for the Reason converted) will.

s VI. Of Mandrels. And ¶ 1. Of Flat Mandrels.

Mandrels are marked F 1. F 2. F 3. F 4. in Plate 15. There are different Sorts of Mandrels, and the sizes of them also different, according to the sizes of the Work.

1. *Broad Flat Mandrels* marked F 1. in Plate 15. with three or more little Iron Pegs or Points near the Verge of its Flat: And these are used for the Turning Flat Boards upon. For the backside of a Board placed Flat upon it, will, when screwed up tight between the Pikes, by help of the Iron Pegs, remain in its place and position, whilst the Flat side of the Work is working upon.

Behind the Backside of this Mandrel (and indeed all other Mandrels) is fitted a long Shank or Rowler, for the String to be wound about while the Work is Turning. This Rowler must be so large in Diameter, that the String wound about it may command the Work about. If the Work be large and heavy, the Rowler must be bigger than if the Work be light; for else the String will not command it about: But if the Diameter of the Rowler be smaller, the Work comes so much swifter about. The Rowler must also be so long between its Shoulders, that it may conveniently contain so many Diameters of the String as shall be necessary to wind about it.

This whole Mandrel is marked F 1. in Plate 15. *a* The Round Flat or Face of the Mandrel. *b* The Rowler. *c c* The Shoulders of the Rowler. *d d d* The Pegs.

¶ 2. Of Pin-Mandrels.

2. **M**andrels are made with a long Wooden Shank, to fit stiff into a round hole that is made in the Work that is to be Turned. This Mandrel is called a Shank or Pin-Mandrel, and is marked F 2. in Plate 15. And if the hole the Shank is to fit into be very small, and the Work to be fastned on it pretty heavy; then Turners fasten a round Iron Shank or Pin of the size of the Hole it is to be fitted into, and fasten their Work upon it. These Mandrels with Iron Shanks are used by Turners that Turn Bobbins or such like Work: Because a Wooden Shank to fit the small Hole through the Work would not be strong enough to carry the Work about.

¶ 3. Of Hollow-Mandrels.

3. **T**Here is another sort of Mandrels called Hollow Mandrels, described F 3. Plate 15. It is both a Hollow-Mandrel, and also used to Turn Hollow Work in it. This Mandrel hath but one Center-hole belonging to it, viz. at the Rowler End or Neck; but it hath a Shank, which supplies the Office of another Center-hole. *a* the Hollow, *b* the Shank or Neck. The Hollow is made so wide, that the Work intended to be Turned Hollow in it may fit very stiff into it, and so deep that it may contain the intended Work.

When it is used, it is pitcht upon the Center at the farther end of the Rowler, and hath its Shank put into one of the Holes of the Joint-Coller described in Plate 13. fig. G. that will best fit it: which Hole standing

ing directly against the *Pike* in the hinder *Puppet*, and receiving the *Shank* into it, guides the *Mandrel* about, as if it were pitch upon two Centers: And the Work being forced stiff into the Hollow of this *Mandrel*, will be carried about with it, exposing the Fore-side of the Work bare and free from the *Joynt-Coller*, and not impeded by *Spikes* from coming at the Work: So that with the *Hook*, *Grooving-Hook*, *Gonge*, or *Flat-Chisel*, according as your Work requires, you may come at it to Turn your intended Form.

Hollow Mandrels are also used in *Collers* that open not with a *Joynt*; But then the *Spindle* is made of Iron, and hath a *Screw* just at its end, upon which is screwed a Block with an Hollow in it, made fit to receive the Work stiff into it.

¶ 4. Of the Screw-Mandrel.

4. **A** Nother sort of *Mandrel* is called the *Screw-Mandrel*, and is marked F 4. in Plate 15. *a* the *Rowler* of the *Mandrel*, *b* the *Shank* or *Screw* is made of Iron, having its two ends Round, and in the middle between the Round ends a Square the length of the *Rowler*, and this Square is fitted stiff into a Square Hole made through the middle of the *Rowler* that it turn not about in the Square Hole. In each Flat end of this Iron *Shank* or *Spindle* is made a Center-Hole, whereinto the *Pikes* of the *Puppets* are pitcht when this *Mandrel* is used. This Iron *Shank* or *Axis* must be made very straight, and ought to be turned upon the two Center-Holes, for exactness; Because on one of the Round ends, or sometimes on both, a *Screw*, or indeed several *Screws* of several Diameters is made. That *Screw* next the end of the

Shank is the smallest, viz. about three quarters of an Inch over, and takes up in length towards the middle of the *Shank*, about an Inch, or an Inch and an half; and so far from the end of the *Shank* it is of an equal Diameter all the way: And on this portion of the *Shank* is made a *Male-screw* of the finest Thread. The next Inch and half (wrought as before) hath another *Male-screw*; but about half a quarter of an Inch more in Diameter than the former, and hath its Threads courser. Another Inch and half hath its Diameter still greater, and its Threads yet courser. And thus you may make the *Shank* as long as you will, that you may have the more Variety of Sizes for *Screws*.

These sorts of *Mandrels* are made for the making of *Screws* to *Boxes*, and their *Lids*, as shall be shew'd in the next Paragraph.

¶ 5. Of *Sockets* or *Chocks* belonging to the *Screw-Mandrel*.

TO this *Screw-Mandrel* belongs so many *Sockets* as there are several sizes of *Screws* on the *Shank*. They are marked F 5 in *Plate 15*. *a* the *Socket* or *Chock*; *b b* the *Wooden Pin*. *c* the *Stay*. *d d* the *Notch* to slip over the *Male-screw*.

These *Hollow Sockets* have *Female Screws* in them made before the *Notch* to slip over the *Male-screw* of the *Screw-Mandrel* is cut. The manner of making *Female-screws* is taught *Numb. 2. fol. 29, 30, 31*. only instead of a *Tap* (used there) you use the several and different sizes of *Screws*, made on the *Screw-Mandrel* to do the Office of a *Tap* into each respective *Socket*; which *Sockets* being only made of *Hard Wood*, it will easily perform, though the *Shank* or *Axis* be but *Iron*. There-

Therefore (as aforesaid) to each of the *Male-screws* on the *Screw-Mandrel* is fitted such a *Socket*, that you may chuse a *Thread* Courser or *Finer* as you please: But this *Female-screw* is open, or hath a *Notch* on one side of it, that it may slip over the *Male-screw*, and the *Threads* of each other fit into each others *Grooves*; and when they are thus fitted to one another, the further or open side of the *Male-screw* is gaged in, or pin'd on the *Female-screw* with a *Wooden Pin* thrust through two opposite *Holes*, made for that purpose in the *Cheeks* of the *Wooden Sockets*, that it shake not.

When the *Treddle* comes down in working, and the *Socket* is fitted on its proper *Screw*, and pinn'd stiff upon it, and the *Stay* held down to the *Rest* of the *Lathe*, then will the *Socket*, and consequently the *Stay* slide forwards upon the *Male-screws*; so that a *Tool* held steddy on any part of the *Stay*, and applied to the out or inside of your *Work*; that *Tools* point will describe and cut a *Screw*, whose *Thread* shall be of the same fineness that the *Screw* and the *Shank* is of.

s. VII. Of Collers.

There are several fashion'd *Collers*: As the *Joynt-Coller* marked G, the *Round Coller* marked H, and the *Coller* marked I, in *Plate 13*.

The *Joynt-Coller* is made of two *Iron Cheeks* marked *b b*, which moving upon a *Joynt c* at the *Bottom*, may be set close together, or else opened as the two insides of the *Joynt-Rule Carpenters* use do. On the the *Inner Edge* of each *Cheek* is formed as many half-round *Holes* or *Semi-circles* as you please, or the length of the *Cheeks* will conveniently admit: These *Semi-circles*

circles are made of different Diameters, that they may fit the *Shanks* or *Necks* of different fix'd *Mandrels*: And these Semi-Circles must be made so exactly against each other on the edges of the *Cheeks*, that when the two *Cheeks* moving upon their *Joynt* are clapt close together, the Semi-Circles on both the *Cheeks* shall become a perfect round hole or Circumference.

Near the top of one of these *Cheeks* is fastned with a *Center-pin*, a Square Iron *Coller* marked *d*, with a small *Handle* to it marked *e*. This square *Coller* is made to contain the breadth of both the *Cheeks* when they are shut together, and to hold them so fast together, that they shall not start assunder; and yet is made so fit, that it may slip off and on both the *Cheeks*.

This *Joynt-Coller* may serve to do the office of the other two *Collers*, and its own particular Office too: yet to save the Charge of the price of this *Tool*, *Turners* seldom use them, but make shift with either of the other; or sometimes with a Hole made in a Board only: But its particular Office is to hold a *Mandrel*, whose *Neck* is fitted to one of its *Holes*, and the Work they are to *Turn* is required to stand out free from the outer Flat of the *Cheeks* of the *Coller*, the better to come at it with the *Tool*; such as are deep *Boxes*, or deep *Cups*, &c.

Numb. XII.
MECHANICK
EXERCISES,
OR
The Doctrine of
Handy-Works.

Applied to the Art of *T U R N I N G*.

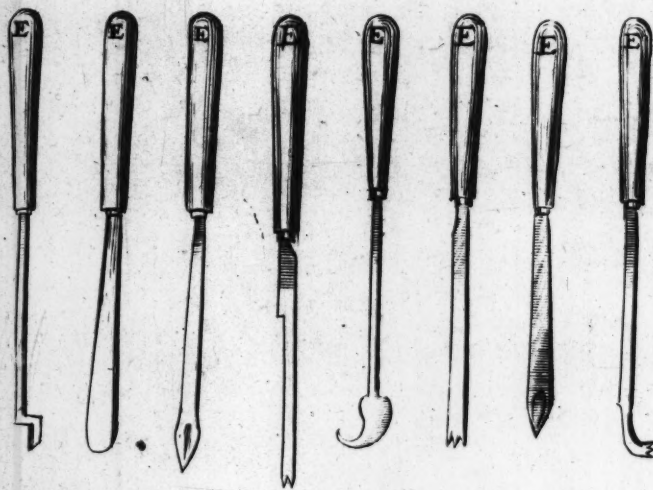
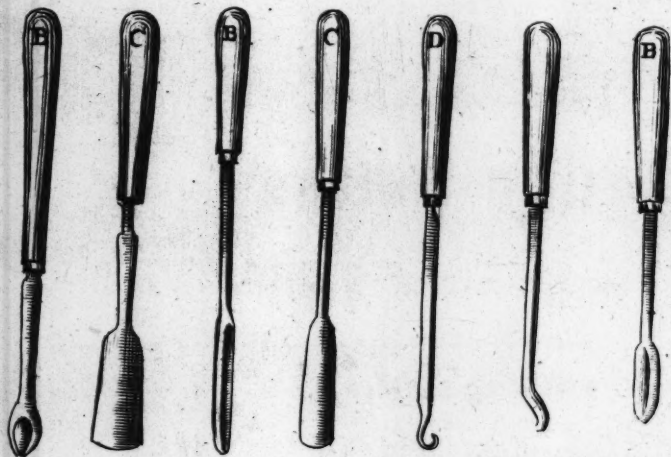
By *Joseph Moxon*, Member of the *Royal Society*, and *Hydrographer* to the
Kings most Excellent Majesty.



LONDON,

Printed for *Joseph Moxon* at the Sign of *Atlas* on *Ludgate-Hill*, 1680.

Plate 15.



MECHANICK EXERCISES,

O R,

The Doctrine of

Handy-works,

Applied to the Art of TURNING.

§ VIII. Of the Mawl.

THE *Mawl* is marked K in *Plate 13*. The Figure of it there is Description sufficient: Its Office is to knock and unknock the *Wedge* in the *Puppets*: and to knock upon the back of the *Cleaving Knife*, when they split their Wood for their Work. The *Joyner's Mallet* would supply the Office of this Tool; but Use has made the *Mawl* more handy for them: Besides when one is batter'd to shivers, they can quickly of a Chump o Wood accommodate themselves with another.

§ IX. Of the Hatchet, Draw-knife, and Cleaving-Knife.

THE *Hatchet* is marked L in *Plate 4*. It is of the same sort that *Joyner's* use; which I described *Num. 5. § 25*, and therefore refer you thither.

F f

And

And the *Draw-knife* is described in *Numb. 7. § 5. Plate 8.* marked *E.* The *Cleaving-knife* marked *M* in *Plate 13.* needs no other Description than that Figure.

§ X. Of the Chopping-Block.

THE *Chopping-Block* is marked *N* in *Plate 13.* It is made of a piece of *Elm-Tree* placed with its Grain upwards and downwards as it grew. It hath three Legs in it, that stand straddling out from the under-side of the *Block* to the Floor, and of such an height, as the *Workman* may have most Command of the Work. See the Figure. Sometimes *Turners* use instead of it a piece of the Trunk of a Tree of about a Foot and an half or two Foot in length from the Ground, or more or less.

§ XI. Of the Callipers.

THE *Callipers* is marked *O* in *Plate 13.* As common *Compasses* (described *Numb. 6. § 32.*) are for measuring Distances upon a plain Superficies; so *Callipers* measure the distance of any round *Cylindrick* Conical Body, either in their Extremity, or any part less than the Extream: So that when *Workmen* use them, they open the two points *a a* to their described width, and Turn so much Stuff off the intended place, till the two points of the *Callipers* fit just over their Work; so shall their Work have just the Diameter in that place, as is the distance between the two points of the *Callipers*, be it either Feet or Inches, &c.

§ XII.

§ XII. Of the Drill-Bench.

THere is yet another *Tool*, or rather a *Machine* used by some *Turners*, called a *Drill-Bench*. It is described in *Plate 14.* *a a a a* a thick Board, about three Inches thick, five Inches broad, and eighteen Inches long. *b b* two *Stiles* placed towards either end, and fastned upright. In the hithermost *Stile* is a *Coller* described § 7. and *Plate 13.* *H*, or any of the other *Collers*: And in the further *Stile* is fitted a square flat tempered piece of *Steel* having a Center-hole in the middle of it, and is placed just against the Center or middle point of the Hole of the *Coller*. *c c* the *Rowler* whose hither end is *Turned* away, so as it just fit into the *Coller*, and at the further end of it, it hath a temper'd *Steel Pin*, to be placed in the Center-hole: And in the middle of the hither end of it, it hath a *Piercer-Bit* fastened straight in, so that it lie in a true straight Line, with the *Axis* of the *Rowler*. Of these *Rowlers* they have several, and *Bits* of different sizes fitted into them, that upon all occasions they may chuse one to fit their purpose.

On the under-side, about the middle of the *Bench*, is fitted and fastned athwart it a square *Iron Coller*, deep enough to reach through the *Cheeks* of the *Lathe*, and so much deeper as it may receive a *Wooden Wedge*, such a one as belongs to one of the *Puppets*: And by the force and strength of the *Wedge* the whole *Drill-bench* is drawn down, and fastned athwart the *Cheeks* of the *Lathe*.

When it is used, it stands athwart the *Cheeks* of the *Lathe* (as aforesaid) with the point or end of the *Bit* towards you; and then the *String* being turned twice

or thrice about the *Rowler*, will (with *Treading* on the *Treddie*) turn the *Rowler* and its *Bit* forcibly about, and cause it enter swiftly into a piece of Wood that shall be prest forwards upon the *Bit*.

When they use it, they hold the piece of Wood they intend to *Drill* or *Pierce* fast in both their Hands, right before them, and prest it forwards upon the *Piercer Bit*; so that by its running about, it cuts a streight round hole into the Wood of what length they please.

But while the *Pole* is rising after every *Tread*, they prest not against the *Piercer-Bit*, so that it is disengaged from doing its Office in the Wood; but in that while, they nimbly give the Wood a turn in their hands, of about one third part of its Circumference; which makes the *Bit* every successive *Tread*, go the straighter through the middle of the Wood: And thus they reiterate *Treads* and keep the Wood turning in their Hands, till the *Bit* is enter'd deep enough.

Thus much for the *Tools* used in common *Turning*: I shall proceed to the working a Pattern or two in Soft Wood; which being well understood, may render a Practicer capable of most Common Work.

s XIII. Of Turning a Cilinder in Soft Wood.

THE Soft Wood Turners Use is commonly either *Maple*, *Alder*, *Birch*, *Beech*, *Elm*, *Oak*, *Fir*, &c. and for some particular purposes each of these sorts are best.

The First Patern we purpose, shall be a *Cilinder* two Inches over, and eight Inches long: Therefore you must chuse a piece of Wood at least two Inches and a quarter over, lest you want Stuff to work upon: Nay, if your Stuff prove shaken or otherwise unsound,

unfound, or your Centers be not very exactly pitcht, you may want yet more Stuff; and that according as it proves more or less faulty, or as the Centers are more unequally pitcht. But supposing the Stuff good, you may take a piece of two Inches and a quarter over, as I said before, and about ten or eleven Inches long: For though the length of the *Cylinder* be but eight Inches, yet you must cut your Stuff long enough to make a Groove at one end of it besides, for the *String* to-run in. If your Stuff be somewhat too big for your Scantlin, and not round enough to go into the *Lathe*, you must *Hew* it pretty near with the *Hatchet* to make it sizable, and afterwards smoothen it nearer with a *Draw-knife*, as you were taught Numb. 7. § 5.

But if you have not Stuff at hand near your size, then you must Saw off your length from a Billet, or some other piece of Stuff, and with the *Cleaving-knife* and the *Mawl*, split it into a square piece near the size, and with the *Draw-knife* round off the Edges, to make it fit for the *Lathe*.

Then set your *Puppets*, and wedge them tight up, so as the *Points* of your *Spikes* stand pretty near the length of your Work assunder, and move the *Pole*, so as the end of it may hang over between the *Pikes*, and also fit the Iron *Pin* in the *Treddle* into a proper *Hole* in the *Cross-Treddle*, so as the end of the *Treddle* may draw the *String* below the Work into pretty near a straight Line with the *String* above the Work: And take the Work in your Right hand, and put it beyond the *String* before you, and with your left hand wind the *String* below the Work but once about the Work, lest it should be too strong for your shallow Centers, as you shall understand by and by,

and then with a pretty strength press the middle of one end of your Work over the Point of one of the *Pikes*, and so make a hole in your Work for one of the Center-holes: Then screw your *Pike* wider or closer according as the length of your Work requires, and pitch the other end of your Work upon the other *Pike* also, and screw your Work a little lightly up: Then try how the Centers are pitcht, by Treading the *Treddle* lightly down; and if you find the Centers are well pitcht, you may without more ado screw up your Work tight: But if your Centers, or either of them be not well pitcht, you must alter them. You may know when they are well pitcht, by treading softly upon your *Treddle*, and holding your Finger steady on the *Rest*, direct the point of it pretty close to the Work: For if in a Revolution of your Work, its Outside keeps at an equal distance from the end of your Finger, you may conclude your Work is well pitcht. But if you find one side of your Work comes nearer your Finger than the other side, you must with your *Flat Chissel* or *Gonge*, (or what is nearest at hand) knock softly, or hard, upon that side that comes nearest to your Finger, till you have forc'd the *Pikes* into the true Centers at the end of your Work; and then you may boldly screw it hard up: But you must be sure to screw it hard up; because it is Soft Wood you purpose to work upon, and the strength of the *Pole* may endanger the drawing or removing the Centers, if the *Pikes* have not good hold of them.

Having found your Centers, take your Work again off the *Pikes*, and wind the *String* once or twice more about your Work, that your *String* (as I said in Numb. 10. § 1. when I wrote of the *String*) may thet ettercommand it, and then wind off or on more
String

String at the end of your *Pole*, or end of your *Treddle*, or both, if your *Work* require it, till the *Pole* draws the *Treddle* up a little above half the length of the *Legs* of the *Lathe*: For about that height your *Leg* may without suddain tiring command the *Pole* down again.

But before you begin to work upon the *Stuff*, I shall inform you how to *Tread* the *Treddle*; In which you may observe this General Rule; That the nearer the Fore-end of the *Treddle* you *Tread*, the easier you bring down the *Pole*; But then the *Pole* in its Spring raises your *Leg* the higher, and may draw the upper side of your *Thigh* against the under side of the *Cheek* of the *Lathe*, and with reiterated *Risings* Gawl and also tyre your *Thigh*.

Place therefore your *Foot* stedly upon the *Treddle*, so far forward as you can to avoid the *Poles* *Rising* from drawing your *Thigh* against the under side of the *Lathe*; and *Tread* the *Treddle* nimbly down, but not quite so low as to knock against the *Floor*: Then abate the weight of your *Tread*, and let the *Pole* draw the *Treddle* up; but still keep your *Foot* stedly, and lightly *Bearing* upon the *Treddle*: For then your succeeding *Treads* will prove easier to your *Leg* and *Thigh*, and you will with your *Foot* the better and quicker command the *Treddle*. Then *Tread* again nimbly down as before, and keep this *Train* of *Treading* till your *Work* be finish'd, or that you may have occasion to stop and examine how rightly you proceed.

In all small *Work* the *Tread* is lightly and nimbly performed; but in large and heavy *Work* the *Tread* comes slow and heavily down.

This

This being premised, you may begin with your *Gonge*: Lay the Round side of it upon the *Rest*, and take the Handle of it in your Right hand, and lay the Fore and Middle Fingers of your Left Hand upon the Hollow of the *Gonge* near the Work, mounting the Edge about a quarter of an Inch above the *Axe* of your Work, and sinking your Right hand a little: for in this position the *Gonge* cuts best: And thus cut down on your Work near one end a *Groove* for your *String* to run in: The *Groove* may be about an Inch, or an Inch and an half long: But it matters not much what depth. Then slip your *String* into the *Groove*, and if you find the *String* will not slip easily, you may put your Foot under the *Treadle*, and lift it a little up, that the *String* when no weight is hanged to it, may slide the easier into the *Groove*.

And by the way you may take notice, that the deeper you cut down the *Groove*, the oftner will your Work come about every Tread; because the *String* that comes down every Tread, measures a small Circumference oftner than it does a greater Circumference: But then the Work is not so strongly carried about; because it hath a less portion of the *String* to command it. This I hint, not that in this our small proposed Pattern it is very considerable: For if you only cut the *Groove* down but so low as there may be a Shoulder at the end, and another against the Work, to keep the *String* from slipping out of the *Groove*, it will be sufficient: But in Heavy Work this *Groove* ought to be cut with discretion.

Now come to the Forming of your Work, and hold your *Gonge* as you were taught before, but somewhat lightly against your Work, beginning at one end, and sliding your *Gonge* gradually to the other, cutting
with

with its Edge all the way you go, and bearing somewhat stiff against the Work every Tread you make on the *Treddie*: And withdrawing it again a little lightly from the Work every Spring of the *Pole*. And thus by Use you must habituate your self to let the Edge of your *Tool* bear upon the Work when the *Pole* and *Treddie* comes down, and to draw it back just off the Work, as the *Pole* and *Treddie* goes up. And thus you must continue till you have rough-wrought all your Work from end to end.

If you have not at first brought your Work clean; that is, if you have not gone deep enough with your *Gonge* to take off all the Risings of the Stuff the *Draw-knife* left, even with the smallest part of your Work, you must in like manner (as before) work it over again. But you must have a special Care you take not too much Stuff away on any part of the Whole Work. For this proposed Pattern being a *Cilinder*; if you take but a small matter too much away from any part, and make it smaller than your given measure there, the whole Work will be spoiled; as being smaller than the proposed Diameter: Which to know, you may by opening the Points of your *Callipers* to two Inches on your *Rule* (the proposed Diameter of your *Cilinder*) try if the Points at that distance will just slip over the deepest *Grooves* of your Work (for we will not suppose that the *Grooves* are of an equal depth with the Rough-working of the *Gonge*) without straining the Joynt: For then your Work is just sizable: If not work over again as before, &c. But we will now suppose you have not taken too much away, but have made a due process with your *Gonge*. Therefore now proceed and use a *Flat Chissel*, about an Inch and an half broad,

to take off the Irregularities the *Gauge* left.

Take the Handle of it in your Right Hand as you did the *Gauge*, and clasping the *Blade* of it in your Left Hand, lean it steddy upon the *Rest*, holding the *Edge* a little assant over the Work, so as a Corner of the thin side of the *Chisel* may bear upon the *Rest*, and that the Flat side of the *Chisel* may make a small Angle with the *Rest*, and consequently with the Work; (which is parallel to the *Rest*) for should you set the edge of the *Chisel* parallel to the Work, it might run too fast into the Work, and sawk it. Therefore you must let the *Chisel* in such a position that the lower Corner, or near the lower Corner of the edge may cut lightly upon the Work: But this position is best described by a Figure, which to that purpose I have inserted in Plate XI. at O, where you may perceive in or near what position the *Chisel* must be set to cut the Work; and how the edge of the *Chisel* *a b* lying assant the Work, and the farther Corner of the edge of the *Chisel* *b* being somewhat mounted, as the Work comes about, the Bottom or near the Bottom of the edge of the *Chisel* is only capable to cut a narrow Shaving off of the Work: and just in this manner you must keep the *Chisel* steddy bearing upon the Work, as the *Pole* comes down, and withdrawing it from the Work as the *Pole* Springs up (as you were taught to use the *Gauge*) and at the same time sliding it forwards from one end of the Work to the other, till it be wrought down all the way to its true Diameter between the points of the *Callipers*: For then a straight *Miller* applied to your Work, the outside of your proposed *Cylinder* will be formed.

Only,

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Only the ends must be cut down square to the length: Therefore open the points of your Compasses to the distance of eight Inches on your Rule, and prick that distance hard off upon your Work, that the points of your Compasses may leave visible marks, by placing one point as near one end as you can, to leave Stuff enough to cut straight down all the way; that is, to cut it square down at right Angles with the outside of the Work. Which to do, you must hold the Handle of the Flat Chissel in your Right hand (as before) and clasp the Blade of it in your Left, and lay one of the thin sides of it upon the Rest, so that the edge may stand upright, or very near upright against the Work. Then sink your Right hand somewhat below the Level of the Rest, that the lower Corner of the edge of the Chissel may mount, and being thrust steddy against the Work just in the mark one Point of the Compasses made, Tread the Treadle, and cut a pretty deep Circle into the Stuff. But you must have a care you do not direct the cutting Corner of the Chissel inwards, but rather outwards, lest you make the end hollow instead of Flat: For if you do take off too little at first, you may by degrees cut it down to a Flat afterwards. As you cut deeper into the Stuff, you must turn the Flat of the Chissel, and with it cut down the Shoulder just at the end on the out side the mark, for else that may hinder the Corner of the Edge of the Chissel for coming at the Work.

Note, that if you hold not the edge of the Chissel truly before the Work, but direct it inwards, and if you hold it not very steddy, and have a good guidance of it, the quick coming about of the Work may draw the edge of the Chissel into it inwards,

and run a dawl on the *Cylinder*, like the Groove of a Screw; and so spoil your Work. For being once wrought to the true size, you cannot afterwards take any more off to cleanse it, &c.

The other end must be cut down as this.

§ 14. Of Turning Flat Boards.

IF your Board be thick enough, you may bore a round Hole in the middle of it; and Turn a *Mandrel* with a *Pin* a very little Tapering, to fit hard and stiff into the round Hole: And if the *Hole* and *Pin* be proportionable in size to the weight of the Board, the *Pin* will carry it about. But you must be very careful the *Hole* be bored exactly straight through the middle, and not inclining on either side the Board more to any part of the Verge than to another; but that the middle of the *Hole* be exactly the Center of the Board the whole thickness though. This *Pin-Mandrel* is described Numb. XI. § 6. and Plate 13.

If your Board be not thick enough to be fastned upon a *Pin-Mandrel*, or that your Work will not admit of an Hole to be bored through the middle of it, you may use the *Flat Mandrel* described Plate 13. F 2. And then you must with your *Compasses* find the Center on the backside of the Round Board (with several proffers if need require) till you have found it, and prick there an Hole for a mark: Then open the points of your *Compasses* to about the thickness of a Shilling wider than the Semidiameter of the *Flat Mandrel*; and with the points of your *Compasses* at that distance describe a Circle on the backside of the Board to be Turned, by placing one Foot in the

the prickt mark, and turning about the other Foot. By this Circle you may pitch the Center of the Board exactly upon the Center of the *Flat Mandrel*: For the points of the *Compasses* being opened about the thickness of a Shilling wider than the Semidiameter of the *Flat Mandrel* will (when you have pitcht the Center of the Board on the Center of the *Mandrel*) place the outer Verge of the *Mandrel* the thickness of a Shilling round about within the Circle described on the backside of the Board: And when it is thus pitcht, you may by laying the Board flat down knock upon the *Rowler* end of the *Mandrel*, and drive the *Pegs* in the flat of the *Mandrel* into the Board, and so hold it steddly upon the *Mandrel*: Then find the Center on the Foreside of the Board also, as you were taught to find the Center on the backside, and put your Board and *Mandrel* upon the *Pikes* of the *Puppets*, and screw them hard up, as you have been taught before.

Sometimes *Turners* use this *Flat Mandrel* without *Pegs*, and then they chalk the Flat side of it very well, and clap the backside of the Board to it, which will (if the Board to be *Turned* be not too heavy, but be well screwed up between the *Pikes*) keep the Board steddly from slipping from its set-position, till you work it.

If in going about of your Work you find it *Wabble*, that is, that one side of the Flat incline either to the Right or Left Hand, you must with soft Blows of an Hammer or other Tool at hand set it to right, and then again screw it hard up: For so often as you thus strike upon the Verge to set the Board true, you force the Steel point of the *Pike* more or less (according to the softness of the Wood.)

towards that side of the Verge you strike upon; and therefore you may perceive a reason for screwing up the Pike so oft as you knock upon the outer Verge of the Board.

But we will now suppose the Board well pitcht and fastned on the *Mandrel* and Center; Therefore take the *Side-Rest* described in § 1. Numb. 10. ¶ 7. and Plate 13. at the Figure e, and f g, and fit it so into the *Lathe* as the upper edge of it may stand range, or parallel to the side of the Board you are to work upon; and so wedge it hard up.

Now you must come to use the *Hook*, described Numb 12. § 5. and Plate 15: For this Tool is most commodious to serve you instead of the *Gouge*, when the Work stands athwart the *Pikes*; because the end of the Blade of this Tool being on its Flat side turned into a Circular Figure, and that Circular Figure turned a little backwards, one of the Edges of this Circular Figure will conveniently (though the Tool be not held straight before the Work) come at any part of the Flat of the Board, and so by the Circulation of the Board against the Edge of the *Hook* cut off its irregular Extuberances.

In the using of this Tool, you must place the end of the *Handle* under your Arm-pit, and hold your left hand on the upper side of the Blade of the Tool close to the *Rest*, and your Right hand close besides your Left Hand under the Tool, and with both your hands clasp the Tool hard, and press it steddy upon the *Rest*, and at the same time hold it also steddy, and yet lightly bearing against the Work, that by the swift coming about of the Work it draw not the Edge of the thin and tender Blade of the *Hook* into it.

You

You must not hold the Blade of this Tool perpendicularly before the Work, viz. parallel to the Pikes, but assaist, so as somewhat about the middle of the Convex of the Hook may touch against the Work. You may begin at the Verge, and so lay several Grooves close by one another till you come to the Center: But you must observe (as was said before in the Cylinder) that you lay all your Grooves of an equal depth into the Board: For if you lay one deeper than the rest, and an Hollow may not properly be in that place, you must again go over your work with your Hook, to work that hawk out: And then perhaps your Board may be made too thin for its intended purpose. But this Craft of the Hand must be acquired with some continued Use and Practice, which will better inform your Judgment what Errours you may be subject to commit, than many words (though significant) upon this Doctrine. And this I'me sure I found, when I first practis'd upon *Turning*.

Having thus with the Hook rough-plain'd the Board (for this Hook does in *Turning* the Office of a Fore-plain in *Joyner*) you must use the *Triangular Grooving Tool*, described Numb. 11. § 5. Plate 15. and with one of its Edges smoothen down the ridges the Hook left on the Board.

But if your Work require any Molding near the Verge or any other part of it, you must work that Molding as near as you can with the Hook, especially where Hollows are requir'd; for that cuts faster and smoother than any other Tool, and most artificially forms an Hollow.

If a Flat be to be laid in the Board, you must first use the *Triangular Point Tool*, and with it strike

strike so many Threads as the breadth of the Flat requires, and lay each Thred almost so deep into the Board as you intend the Flat shall be: And afterwards to smoothen it down, you must use the *Flat Grooving Tool*, or a *Flat Chissel*, and with either of them finish the Flat to its intended Depth and Breadth. And where a fine Thread or Circle is to be laid in the Board, you must use the *Triangular Point Tool*. And thus as you see occasion, you must accommodate your self with a Tool apt and proper for your purpose *viz.* such a Tool as will most conveniently come at, and form the intended Work.

Numb. XIII.
MECHANICK
EXERCISES,
OR
The Doctrine of
Handy-Works.

Applied to the Art of TURNING.

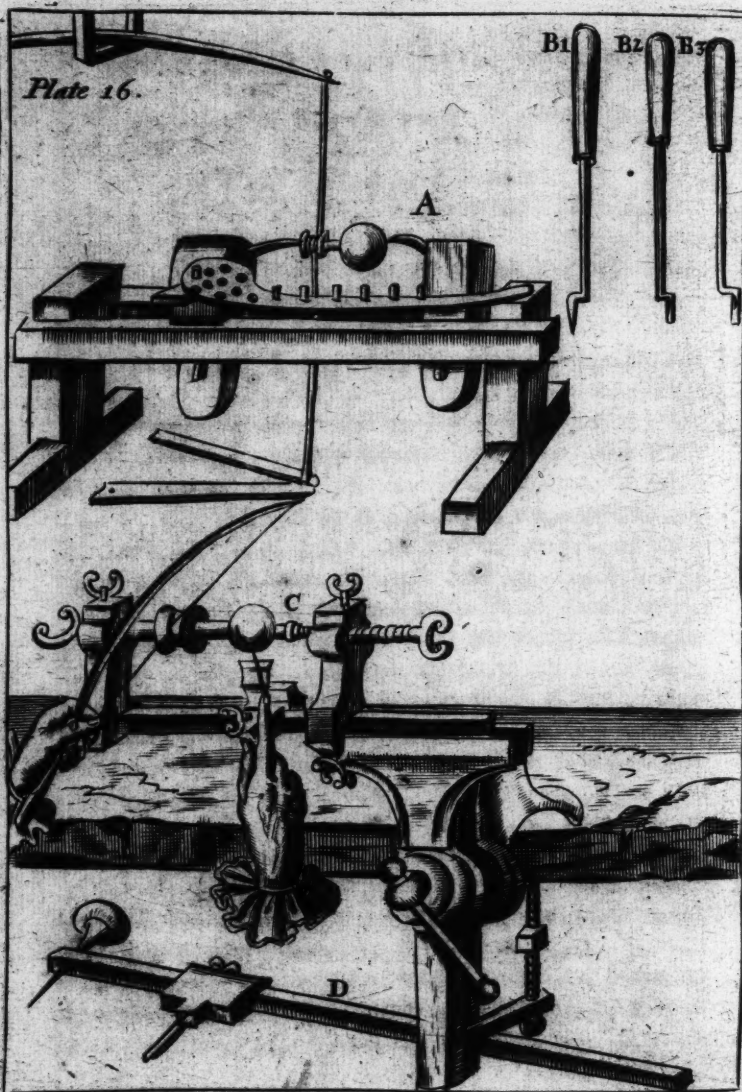
By *Joseph Moxon*, Member of the *Royal Society*, and *Hydrographer* to the
Kings most Excellent Majesty.



LONDON,

Printed for *Joseph Moxon* at the Sign of *Atlas* on *Ludgate-Hill*; 1680.

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Plate 16.



MECHANICK EXERCISES,

O R,

The Doctrine of

Handy-works,

Applied to the Art of TURNING.

§ XV. Of Turning Hard Wood, and Ivory.

IF the Wood be very hard, as *Ebony*, *Lignum Vita*; or if it be *Ivory*, *Bone* or *Horn* they are to Turn; they neither use the same Tools they do for Soft Wood; because their edge is too tender: nor do they use their other Tools as they do soft Wood, For the Tools made for Hard Wood are made with a stronger Point, edge, &c. than they are for Soft, as was said *Numb. 11. § 5.* And they use them differently; because for Turning Soft Wood they hold the Edge of the *Gouge* and *Flat Chissel* at some considerable Distance from the *Rest*, mounting the Edge at such an Angle as will best cut off from the Work as great a Chip as they can, or desire. And as they Turn the Work smaller, they guide the *Chissel* to follow the Work; But for Hard Wood they raise the *Rest* near the Horizontal Plain of the *Axis* of the Work, setting it as close as conveniently they can to their Work, and lay their Tool flat and steady upon the *Rest*; which being hard held in this po-

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sition,

sition, does by the coming about of the Work, cut or tear off all the Extuberances the Tool touches in the sweep of the Work. So that (as I said before) as in *Turning* Soft Wood the Tool does somewhat follow the Work; in *Turning* Hard Wood the Work comes to the Tool: And therefore you may perceive a great reason they have to keep the Tool steady: For should it in one sweep of the Work be thrust nearer the *Axis* in any place, it would there take off more than it should.

Having prepared the Work fit for the *Lathe*, either with *Hewing* (as hath been shown *Numb. 5. § 7.* and *Numb. 11. § 13.*) or, as some Hard Woods and Ivory may require, with *Rasping*, they pitch it between the *Pikes*, as before has been shown, or such Work as it may be, as Boxes, and generally all Hollow Work, they fit into *Collers*, either by screwing the *Mandrel* on an Iron *Axis*; or fitting it with some other of the *Mandrels* described *Numb. 11. § 6.* as is proper for it: As sometimes they fit the Work tight into an *Hollow Mandrel*, and the tight fitting holds it whilst it is working upon: And sometimes, if the Work be very thin, they fix it on a *Flat Mandrel* with *Cement*; But they are always either to chuse one of the *Mandrels* described already in *Numb. 11. § 6.* or else contrive (as they often do) some other *Mandrel* convenient to the opportunity that accidentally their Business may require. For the Work (whether it be pitcht on the *Pikes*, or fitted into *Hollow Mandrels*, or otherwise) must run very steady and tight about.

But having thus fitted it into the *Lathe*, they begin to work with the *Sharp-pointed Grooving Tool*, or else with the *Triangular Grooving Tool*, and with the point
of

of either of these *Tools* break the Grain of the Wood, by laying small Grooves upon its Surface, till they have pretty well wrought away the Extuberances, and brought the Work tollerably near an intended shape, by streightning, hollowing, and leaving Risings in their several proper places.

Afterwards with Edg'd *Grooving Tools* of a proper Breadth, they cut down and smoothen away the Extuberances left by the *Sharp-pointed Grooving Tool*, or the *Triangular Grooving Tool*, and bring the Work into a perfect shape. Which done, they smoothen the work with the Edge of a piece of a Blade of a broken Knife, basil'd away, by following the Work with it: That is, holding the basil'd Edge of the Knife close against the Work while it comes about: For then its sharp Edge scrapes or shaves off the little roughness the grosser *Tools* left upon the Work.

Lastly, they hold either a piece of Seal Skin or Dutch Reeds (whose outer Skin or Filme somewhat finely cuts) pretty hard against the Work, and so make it smooth enough to polish.

Hard Wood they polish with *Bees Wax*, viz. by holding *Bees Wax* against it, till it have sufficiently toucht it all over; and press it hard into it by holding hard the edge of a Flat piece of hard Wood made fizable and suitable to the Work they work upon, as the Work is going about. Then they set a Gloss on it with a very dry Woollen Rag, lightly smear'd with *Sallad Oyl*.

But *Ivory* they polish with Chalk and Water, and afterwards dry it with a Woollen Rag, and a light touch of *Sallad Oyl*; which at last they rub off again with a dry Woollen Rag, and so set a Gloss on it.

If there be a Screw to be made upon the thin Edge of an *Ivory*, or *Hard Wood*, or *Brass Box*, they use the *Screw Mandrel*, and its *Socket*, described *Numb. 11. § 6. ¶ 4* and *5.* as is shewn at the latter end of that Section.

§. XVI. Of Turning long and slender Work of Ivory.

SOME *Turners* to shew their Dexterity in *Turning*, and make others that know not the way how it is done admire at their Skill, *Turn* long and slender Sprigs of *Ivory* as small as an *Hay-stalk*, and perhaps a Foot or more long: which to perform they cut a piece of *Ivory* to its intended length; but strong enough to bear working till they bring it to as small a *Cylinder* as they can; which being thus forwarded, they place a *Joynt Coller* (as is described *Numb. 11. § 7.*) made small and fit for their purpose, just in the middle of their Work: only that their Work may *Bear* at a smaller length, and consequently be stronger for being thus supported while it is *Turned* yet smaller. Then they place other *Collers* between the *Pikes* and the middle *Coller*, and *Turn* the whole *Cylinder* slenderer yet. And thus by placing *Collers* where ever they find the Work buckle, they (as aforesaid) with *Sharp Tools*, tender touches, somewhat a loose and fine *String*, weak *Bow*, and great care and diligence work the whole *Cylinder* down as small as they list, either with *Moldings* or other Work upon it, as best likes them.

The properest *Lathe* to *Turn* this slender Work in is the *Turn-Bench* described § 18. *Plate 16.*

§ XVII. Of the *Brasiers Lathe and Turning Tools; and their manner of using them.*

B*rasiers* that *Turn Andirons, Pots, Kettles, &c.* have their *Lathe* made different from the *Common Turners Lathe*, as you may see in *Plate 16.* at *A*, where the *Cheeks, Puppets* and *Rest, &c.* are much stronger, and the *Pikes* stronger and longer than those the common *Turners* use. Their *Edge Tools* which they call *Hooks*, are also of a different shape, as the *Figures* of them described at *B 1, B 2, B 3.* in the said *Plate* shew, as being bent backwards and forwards towards the cutting end; somewhat like an *z*. And as the common *Turners* work with a round *String* made of *Gut*, as hath been described *Numb. 10. § 1.* ¶ 14. The *Brasiers* work with a *Flat Leather Thong*, which wrapping close and tight about the *Rowler* of their *Mandrel* commands it the easier and more forcibly about. Their *Thong* runs between the *Cheeks* of the *Lathe*.

The whole *Lathe* and its parts are made so strong because the Matter they *Turn* being *Mettal*, is much heavier than *Wood*, and consequently with forcible coming about, would (if the *Lathe* were *slight*) make it tremble, and so spoil the *Work*; as hath been said before.

The reason why the *Hook* is so turned backwards, and again forwards, towards the end, is, that they may the better direct the *Edge* of it as much below the *Horizontal Plain* of the *Pikes* as they list, the better (in many cases) to come at the *Work*: For contrary to *Soft Wood, Hard Wood* and *Ivory Turners*, they always dip the end of their *Hook* below the *Rest*, that

so the *Hook* resting very steddy upon the *Rest*, and also against one of the Iron *Pins* standing upright in the *Rest*, and held very steddy forwards to the Work, the strong coming about of the Work against the strong Edge of the *Hook*, scrapes off the extuberant Metallizing in that Sweep.

I need no further describe the *Lathe*, and other *Tools* that belong to *Brassiers* Turning; or more of the manner of using them; because, by the whole preceding Discourse these Arguments are largely and sufficiently handled: especially considering I have given you the Figures of them in *Plate 16.* as afore-said.

Only, their way of *Whetting* their *Tools* being different from the *Whetting* of other Turning *Tools*, I shall say somewhat to: For they *Whet* their *Hooks* upon a broad Flat *Slate*, holding the *Hook* almost perpendicular, that the *Basil* of its Edge may comply with the Flat of the *Slate*; with clasping the upper end of the *Handle* in their left hand to lean the heavier on it, and clutching the *Shank* of the *Blade* near the *Hook*-end in the right hand, to guide it: And thus with Spittle or Water rub forwards and backwards on the *Slate*, till they have sharpened the Edge of the *Hook*. But if it be a Round end *Hook* they whet, they chuse a *Groove* in the *Slate* fit to comply with the round edge of the *Hook* (for they have different sized *Grooves* in the *Slate* for that purpose) and so in it rub forwards and backwards as afore-said.

§ XVIII. Of Turning Small Work, of Brass & other Mettal.

Small Work in Mettal is Turned in an Iron Lathe called a *Turn-Bench*. The Figure of it is described in *Plate 16.* at C. When they use it they screw it in the *Chaps* of a *Vice*, and having fitted their Work upon a small Iron *Axis* with a *Drill-Barrel* fitted upon a square Shank at the end of the *Axis* next the left hand, they with a *Drill-Bow* and *Drill-string* carry it about, as was shewn *Numb. 1. fol. 6, 7.* with this difference, that when a Hole is drill'd in a piece of Mettal, they hold the *Drill-bow* in their Right Hand; but when they Turn Small Work, they hold the *Drill-bow* in their left hand, and with their right hand use the *Tool*, which is commonly a *Graver* or sometimes a *Sculptor*, fit to such Moldings as are to be made on the *Mettal*.

They begin to work first with the sharp point of a *Graver*, laying the Blade of it firm upon the *Rest*, and directing the point to the Work, and lay Circles upon it close to one another, till they have wrought it pretty true: Then with one of the broad Edges of the *Graver* they smoothen down what the Point left, and afterwards with *Sculptors*, *Round* or *Flat*, or great or small, they work their intended Moldings.

The Circumstances and Considerations in the choice of a *Drill-bow* and *Drill-string* for Turning, are the same with what you find *Numb. 1. fol. 6, 7.* for Drilling.

§ XIX. Of laying Moldings either upon Mettal or Wood, without sitting the Work in a Lathe.

I Had soon after the Fire of London occasion to lay Moldings upon the Verges of several round and weighty flat pieces of *Brass*: And being at that time by reason of the said Fire unaccommodated of a *Lathe* of my own, I intended to put them out to be *Turned*: But then *Turners* were all full of Employment, which made them so unreasonable in their Prizes, that I was forc'd to contrive this following way to lay Moldings on their Verges.

I provided a strong Iron *Bar* for the *Beam* of a *Sweep*: (for the whole *Tool* marked in *Plate 16*, is by Mathematical *Instrument-makers* called a *Sweep*.) To this *Tool* is filed a *Tooth* of Steel with such *Roundings* and *Hollows* in the bottom of it as I intended to have *Hollows* and *Roundings* upon my Work: For an *Hollow* on the *Tooth*, makes a *Round* upon the Work; and a *Round* upon the *Tooth* makes an *Hollow* on the Work; even as they do in the *Molding Plains Joiners* use. Then I placed the *Center-point* of the *Sweep* in a *Center-hole* made in a square *Stud* of *Mettal*, and fixed in the *Center* of the *Plain* of the Work: and removed the *Socket* that rides on the *Beam* of the *Sweep* till the *Tooth* stood just upon its intended place on the *Verge* of the Work, and there screw'd the *Socket* fast to the *Beam*.

To work it out, I employ'd a Labourer, directing him in his left Hand to hold the Head of the *Center-pin*, and with his Right Hand to draw about the *Beam* and *Tooth*, which (according to the strength) he us'd, cut and tore away great Flakes of the *Mettal*, till
it

it receiv'd the whole and perfect Form the *Tooth* would make; which was as compleat a Molding as any Skilful *Turner* could have laid upon it.

Having such good Success upon *Brass*, I improv'd the Invention so, as to make it serve for *Wood* also. And made a *Plain-Stock* with my intended Molding on the *Sole* of it, and fitted an *Iron* to that *Stock* with the same Molding the *Sole* had.

Through the sides of this *Stock* I fitted an *Iron Beam* to do the Office of the *Beam* I used for the *Sweep*, viz. to keep the *Plain* always at what position I list'd from the *Center* (for thus the *Iron* in the *Plain* wrought about the *Center*, even as the *Tooth* in the *Sweep* (before rehearsed) and to that purpose I made a round *Hole* of about half an *Inch* Diameter near the end of the *Iron*: Then in the *Center* of the *Work* I fixed a round *Iron Pin*, exactly to fit the said Round *Hole*, putting the Round *Hole* over the *Pin*, and fitting the *Iron* into the *Stock* commodious to work with. I used this *Plain* with both Hands, even as *Joyners* do other *Plains*: For the *Iron Pin* in the *Hole* of the *Beam* kept it to its due Distance from the *Center*; so that neither hand was engaged to guide it.

But note, The *Stock* of this *Plain* was not straight (as the *Stocks* of other *Plains* are) but by Hand cut Circular pretty near the size of the Diameter of the intended Molding: And yet was made to slide upon the *Beam*, farther from, or nearer to the *Center*, as different Diameters of *Verges* might require.

- XX. To Turn several Globes or Balls of Ivory
within one another, with a Solid Ball in
the middle.

YOU must first Turn your Ivory Ball or Globe truly round; of your intended Diameter: Then describe a Circle exactly through the middle or Equinoctial of the Globe: Divide that Circle into four equal parts, and pitch one point of a pair of Compasses in one of those Divisions, and extend the other point to either of the next Divisions, and describe with it a Circle round about the Globe. Then remove the standing point of the Compasses to either of the next Divisions in the Equinoctial, and in like manner describe another Circle round about the Globe.

But note, that the moving Point of your Compasses must be somewhat bended inwards; For else its point will not describe a Circle on the greatest Extuberances of the Globe, but will slide off it.

Thus shall the Ball or Globe be divided into eight Spherical Quadrants: Describe as great a Circle as you can in each of these Quadrants, and each two Centers of every two opposite Circles shall have an imaginary Axis pass between them: And if the Globe be successively pitcht upon all the rest of the Centers, so as the imagined Axis passing between it and its opposite Center, lie in a straight line with the Pike and the Center of the Coller it is Turned in, the working out of all the Hollows on the Ball will be but common Turners Work, as you will find hereafter. This is in brief the Theory: But to the Practice. You

You must use an *Hollow Mandrel*, made fit stiffly to receive the convexity of the *Globe* in its concavity, so as it may stick firmly in the *Mandrel* in its Position: And you must take care that in pitching the *Globe* into the *Mandrel*, that the imaginary *Axis* of the *Globe* (which is the Line passing between the two Centers of the two opposite Circles as aforesaid) lie in a straight Line with the *Axis* of the *Mandrel*; which you may know by examining whether the Circle described with your *Compasses* (as aforesaid) on the Center (aforesaid) wobble not in a whole Revolution of the *Globe* from the point of a Tool applyed stedly to it.

Having thus pitcht the *Globe* true, and fixt it fast into the *Mandrel*, you must begin to work with the *Triangular Grooving Point* (described Numb. 11. s 5. and Plate 15.) placing the point of it pretty near the Center of the Circle, and work into the *Ball* with the *Grooving Point*, and so by degrees make a Hollow in the *Ball* so deep and so wide as you think convenient, I mean so deep from the Superficies of the *Globe* towards the Center of the *Globe*, and so wide from the Center of the Circle described on the Superficies of the *Globe* towards that Circle, as it may have a convenient Substance between this Hole and the next intended to be *Turned*.

Thus must every one of the eight Circles described on the *Globe* be successively by the same Rule, and after the same manner be pitcht outwards, and fixt into the *Mandrel*, and then Hollowed out as the first was. Where note, that every Hollow is to be *Turned* to the same depth and

width exactly as the first was: Which to do, you must use a *Gage* made of a thin Plate of Iron or Brass, as is described in *Plate 17. Fig. D.* whose two sides from *a* the Bottom of the *Gage*, to *b* the *Shoulder* are the depth of the *Hollow* from the Superficies of the *Globe* towards the Center: *b b.* is the width of the *Hollow* at the Superficies of the *Globe*; and *a a* is the bottom width of the *Hollow*; and the concave Arch between *a a* is an Arch that the Convexity of the little Solid Ball to be Turned within all the *Spheres* must comply with. So that when each *Hollow* is Turned, the *Gage* must be put into it to try how the sides of the *Hollow* complies with the sides of the *Gage*, and also how the Arch in the bottom of the *Gage* complies with the surface of the Solid Ball in the middle.

Having thus Turned all the *Hollows* in the *Globe*, you must provide several thin and narrow Arching Grooving Tools, whose convex and concave Arches comply both with the Convexity and Concavity of each *Globe* or *Sphere* to be Turned within the outermost: So that beginning at the Bottom of the *Hollow*, you Turn just half way of the Solid Ball loose from the *Sphere* it is contained in, viz. as far as the Equinoctial of the *Globe*; and in thus Turning it, you must take great care, that the Solid Ball on its Convexity and the Concavity of the *Sphere* it is contained in, be both at the same time Turned exactly Spherical.

Thus one half of the Solid Ball being Turned loose, you may in like manner Turn the next *Sphere* it is included in half loose also: And so successively as many *Spheres* as you list.

Having

Having thus *Turned* one half of all the *Spheres* loose, you must take the whole *Globe* out of the *Hollow Mandrel*, and pitch and fix the *Globe* again into the *Mandrel*, so as the imagined *Axis* of the *Hollow* opposite to the last loosened *Hollow* lie in a straight line. (as before was taught) with the *Pike* and *Center* of the *Coller* the *Mandrel* runs in, and then *Turn* the other half of the *Solid Ball* and *Spheres*, also loose, as the first half was *Turned*.

§ XXI. To Turn a *Globe* with several loose *Spheres* in it, and a *Solid Cube* or *Dy* in the middle of it.

THIS is *Turned* after the same manner the former *Ball* was *Turned*; only instead of dividing the *Equinoctial* of that *Globe* into four equal parts, the *Equinoctial* of this must be divided but into three Equal parts, and their *Semi-Circle* drawn through the divisions into either *Pole* of the *Globe*: So shall the *Globe* be divided into six equal parts or *Segments*; in each of which parts must be described a *Circle*, as was described before in the *Globes* of eight equal parts; and in these six *Circles* must be made six *Hollows*, as before there was eight: But instead of working the *Bottom* of each *Hollow* *Spherical*, now the *Bottom* must be wrought *Flat*: So shall the *Cube* when these six *Hollows* are thus made, be formed: and the *Hollows* being exactly of the same depth, and flat in the *Bottom*, the *Cube* or *Dy* will loosen, and each of the six *Flats* in the *Bottom* will become the six sides or *Faces* of the *Cube*.

The manner of loosning all the other inward *Spheres* is as the Former: Only, that was loosned with twice pitching the *Ball* in the *Mandrel*, because the *Centers* of the *Hollows* lay opposite to one another; But to loosen this *Ball* will require three *Pitchings* into the *Mandrel*; because the *Centers* lie not opposite to one another.

§ XXII. To Turn a *Cube* or *Dy* in an *Hollow Globe*, that shall have but one *Hole* on the outside to work at.

THE Outside of this *Globe* must be Turned Round, viz. Spherical, as the former, and fixed in an *Hollow Socket* (as before hath been taught) Then must an *Hole* be Turned in the *Globe* so deep and so wide as you please, as in the Former *Globes*, and the Bottom of that *Hole* Turned Flat, for one side or Face of the *Cube* or *Dy*: Then with a Semi-circular Tool loosen the whole Core or middle of the *Ball*, and pitch the Core with the point opposite to the Center of the already Flatted Face of the *Dy* outwards against the *Hole* in the *Globe*, and so fasten it in this position, by pouring in some melted Hard Wax or other Cement; and then with a Flat Tool Turn the Foreside (viz. the side opposite to the first side) flat also: Which done, loosen it out of the Wax, and successively pitch the other sides to be Turned Flat carefully against the *Hole*, so as all the sides have Right Angles to each other, and fastning them with Wax or Cement (as before) Turn them by the same Rule flat also.

Now

Now to make this Thing more admirable to the ignorant Spectator, you may make the *Dy* as big as you can, and the Hole you Turn it at as little as you can; that it may the more puzzle the Wit of the Enquirer to find how so great a *Dy* should have Entrance at a small Hole, unless the Hollow Ball were Turned in two Halves, &c.

Now to make this Thing more admirable to
the ignorant Spectator, you may make the De-
sign as you can, and the Hole you Turn it as
you can; that is, the more you
of the Engineer to find how to make a
small Hole, unless
at Hollow Ball were turned in two Places

Numb. XIV.
MECHANICK
EXERCISES,
OR
The Doctrine of
Handy-Works.

Applied to the Art of *T U R N I N G*.

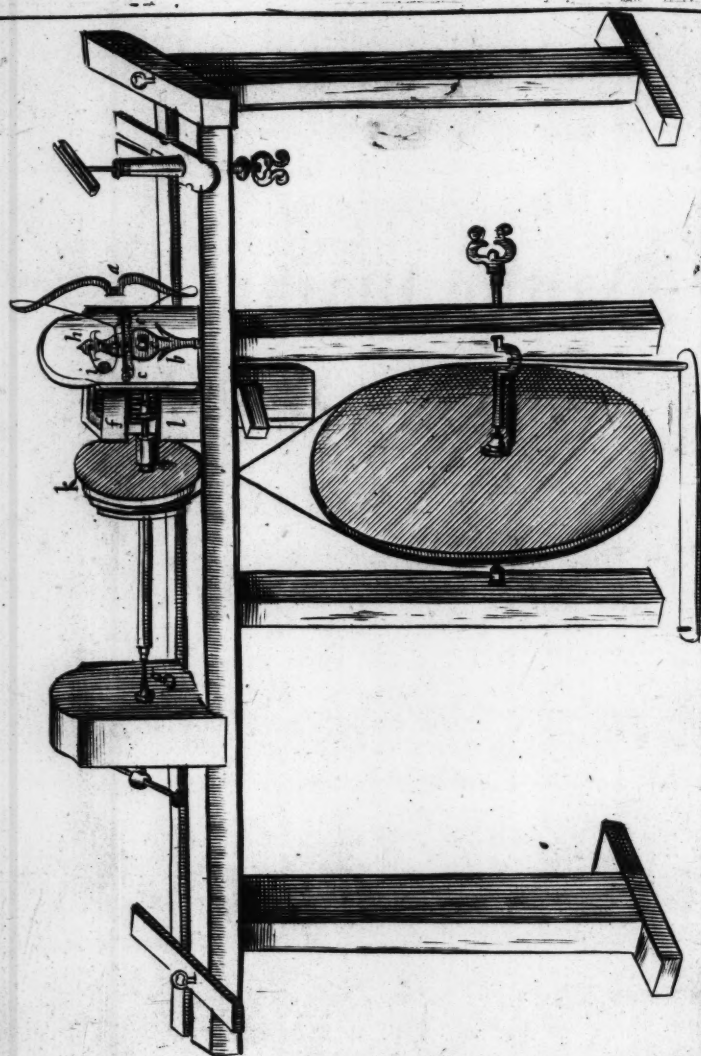
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LONDON,

Printed for *Joseph Moxon* at the Sign of *Atlas* on *Ind-
gate-Hill*, 1680.

Plate 17.



MECHANICK EXERCISES,

O R,

The Doctrine of

Handy-works,

Applied to the Art of TURNING.

s XXIII. Of Turning Oval Work.

THis Work may be perform'd in the Common *Lathe* that goes either with the *Treddle Wheel* or the great Wheel; because the Work must run always one way, if the *Puppet* be made to it with the Machination described in *Plate 17.* and an *Iron Axis* be made to carry the Work about, and to its end be fitted and fastned a *Brass Collar* with a Female Screw in it, to screw on the *Mandrel* that the Work you intend to Turn is fixt upon.

To the Foreside of this *Puppet* is fastned at *b* as on a Center-pin a strong *Iron Collar* marked *b b*, and this Collar is called the *Moving-Collar*; because it moves between the *Iron Shackle c c* and the Fore side of the *Puppet*. Into this *Moving Collar* is fitted the *Hollow Axis* marked *c*, so as to turn round in it as if it were in any of the other *Collars* formerly described; but the *Moving Collar* moving between the

K k

Shackles

Shackles and the Fore-side of the *Puppet* carries the *Hollow Axis* with it athwart the *Puppet*, even so far as is the width of the *Hollow* between the *Shackle* and the Fore-side of the *Puppet*. And thus by the moving of the *Hollow Axis* backwards and forwards the Work screwed in it, having an *Edg'd* or a *Pointed Tool* applied to it receives that *Oval Form* which is made upon the *Guide*.

But to make it move thus to and from you, there are required *Several Machina Helps*: For there is a strong *Steel Bow* as at a fastned about its middle part to the further side of the *Puppet*, which stands about an Inch forwarder than the Fore side of the *Puppet* with its hollow side to the Workman. And to the ends of this *Steel Bow* is fastned a strong *String* of Gut, and to the middle of that *String* in a Noos is fastned another strong *Gut-string* with a Noos at its end. This last mentioned *String* is made exactly of that length that when the nearest side of the *Guide*, viz. its least Diameter is set into the *Groove* of the *Guide-pulley*, and the *Bow* is strained, and this *String* laid in the *Groove* of the *String-pulley*, the Noos at the end of it may be put over the *Iron Button* fixed in the top of the *Moving-Collar*. For then as the *Treadle-Wheel* carries the *Axis* about, the *Guide* being firmly fastned upon the *Axis* comes also about; and having the *Groove* of the *Guide-pulley* set against the outer edge of the *Guide*, as the great Diameter of the *Guide* is turned against the *Guide-pulley*, the *Moving-Collar* being drawn by the strength of the *Bow*, draws the *Hollow Axis* along with it, as also the Work screwed in the *Hollow Axis*: And thus as the small Diameter of the *Guide* comes to the *Guide-pulley*, the small Diameter of the Work is Formed; and as the great

Diam-

Diameter of the *Guide* comes to the *Guide-pulley*, the great Diameter of the *Work* is formed.

This is the Sum of *Oval Turning*.

But that the whole Machine may be yet better understood, I shall more particularly give you the names of all its parts, together with a Description upon its most material parts, where the *Fore-Puppet* is more largely delineated in *Plate 18* at *A*, where also some of the Members most difficult to be described are drawn more at large by themselves.

a The *Bow*.

b The *Moving Collar*.

c c The *Socket* in which the *Collar* is moved.

d The *Stop-screw*, to take out when the *Hollow Axis* moves in the *Moving Collar*.

e The *Hollow Axis*.

f The *Head*, in which is contained the several *Guides*.

g The *Center Head*.

h The *Button*.

i The *String-pulley*.

k The *Wheel-pulley*.

l The *Guide-pulley*.

¶ *i*. Of the *Hollow Axis* and its *Shank*, marked *a* in *Plate 18*.

THE *Shank* is a Bar of Iron about an Inch thick, and two Foot long, having in its further end a Center-hole to pitch upon the *Pike* in the further *Puppet*; but its hither end is made square to fit tight into a square *Socket* in the *Brass Hollow Axis*: And when it is thus fitted into the hither end of the

K k 2

Brass,

Brass, it is Turned true Cylindrically round, so as to fit into the round Hole in the *Moving Collar*. The Diameter of the Round is about two Inches, and the length about two Inches straight; but then a Shoulder is Turned to the Brass Cylinder, to stop it from slipping through the *Moving Center*. In the Fore-end of this *Hollow-Axis* (*viz.* in the Brass Cylinder) is Turned a wide Hole about an Inch and a quarter Diameter, and an Inch deep: And in this wide Hole is Turned a Female Screw with a coarse Thred, to receive a Male Screw made behind the *Mandrel* that the Work is fixed upon.

About the middle of this Iron *Shank* is placed a *Pulley* made of Wainscot Board, about eight Inches Diameter, and an Inch thick, with a *Groove* on its outer edge about half an Inch wide, and half an Inch deep for the *String* of the *Treddle Wheel* that carries the *Axis* about to run in: And between this *Pulley* you may (if you will) have several lengths of such *Male-screws* as was described *Numb. 11. § 6. ¶ 4.* and *Plate 15.* to make Screws with, if you please.

See the Figure *a d e b*, disjunct from the rest of the Work.

a The hinder end.

d The Pulley of the *Axis*, or *Wheel-pulley*.

e The Hollow or Hole in the Fore-end of the *Hollow Axis*.

b The Shoulder of the *Hollow Axis*.

¶ 2. Of the *Moving Collar* marked *b* in *Plate 18*.

THis whole Member is called the *Moving Collar*, though the *Collar* strictly is only the round Hole at *a*, into which the *Hollow Axis* is fitted. It is made of

of Iron to reach from its top at *b* (the *Button*) down to the bottom of the *Cheeks* of the *Latke*, as at *b*; upon which Pin (as on a Center) the whole *Moving Collar* moves backwards and forwards; its extrem Breadth is about three Inches, and its thickness above a quarter of an Inch. Its Neck at *c* is clasped but not fixed down to the Fore-side of the *Puppet*; for this Neck is only gaged in the *Shackle* marked *c*, so as the Neck (and consequently the whole *Moving Collar*) may slide from end to end of the *Shackle* forwards and backwards. *d* A small *Female Screw*, into which through a Hole in the *Shackle* is fitted a *Male Screw* to hold the *Moving Collar* and the *Shackle* together, that the *Moving Collar* may not move when only round Work is Turned in the *Collar*.

¶ 3. Of the Fore-side of the *Puppet*, and the *Shackle* marked *c*.

U Nder this *Shackle* (*viz.* between it and the Fore-side of the *Puppet*) moves the Neck of the *Sliding Collar* from *a* to *b*, when the ends at *c c* are fixed down to the Fore-side of the *Puppet* with two Iron Screws.

¶ 4. Of the Hollow in the *Puppet* marked *d*.

I N the middle of the *Puppet* is hollowed out a Hole about three Inches between the Fore and Backside of the *Puppet*, and four Inches athwart the *Cheeks* in the *Puppet*, and four Inches deep: So that about an Inch of Substance remains on each of the four upright sides. But the Top is quite open. (as at *a*) Through the middle of this square Hole runs the Iron Axis

K k 3

marked

marked *b b*, on which is fixed the several *Guides* that are to be used in this sort of Working.

It is open at the Top, that Light may be let in to set the *Guide-pulley* to which *Guide* you please, and it is open on the hither side as at *e e* about an Inch and an half above and below the *Axis*, that the *Guide-pulley* may be slid on its *Axis* to any of the *Guides*.

The *Guide-pulley* marked *d* is a Brass Pulley of about an Inch Diameter, and a little above a quarter of an Inch thick, having a *Groove* in the Edge of it to receive the Edge of the *Guide*. It hath in its middle a round Hole about half an Inch Diameter, which round Hole slips over a round Iron Pin of the same Diameter, marked *f f*, so as it may slide from one end of the said Iron Pin to the other, according as the *Guides* may be fixed towards either end.

When it is used, the Groove in the Edge of this *Guide-pulley* is set against the Edge of the *Guide*, and being fitted tight on the round Iron Pin afore-said, and the two ends of the Iron Pin fast fixed into the Wood of the *Puppet*, the *Guide-pulley* may indeed move round on the Iron Pin; but the strength of the Iron Pin, and *Guide-pulley* will resist the extuberick parts of the Edge of the *Guide*; and so with the assistance of the strength of the Steel *Bow* force the *Guide* and *Hollow Axis* to move backwards; and then an Edge-Tool held to the Work in the *Mandrel* screwed in the *Hollow Axis* will describe the same Figure on the Work as is on the outer Edge of the *Guide*.

Note, that when you are at Work, you must keep the Hole in the middle of the *Guide-pulley* well oyl'd,

as also the round Iron Pin it slides and turns round upon; because this *Guide-pulley* ought to run round; For then the *Axis* will have an easier and swifter motion, though it may indeed perform the Work if it run not round upon the Iron Pin.

§ XXIV. Of Rose-Work, &c.

Rose-Work Turning, or Works of any other Figure, are performed by the same Rule and after the same manner as *Oval Work* is made; only by changing the *Guides*, and using one whose outer Edge is made with the Figure, or several Figures you intend to have on your Work.

§ XXV. Of Turning Swash-Work.

TO the Turning of *Swash-Work* you must have two such *Puppets* as the *Fore-puppet* described in § 22. And also a Round *Swash-board*, about ten Inches Diameter, and an Inch and an half thick, as is *a* in Fig. B. *Plate* 18. Upon both the Flat sides of this *Swash Board* in a Diametrical Line is fastned upright an Arch of a Quadrant made of a Steel Plate, about half a quarter of an Inch thick, and an Inch and a quarter broad, as at *b b, c c*. The convex edges of these Quadrants are cut into Notches, like the Teeth of an Hand-Saw; that according as you may have occasion to set the *Swash-Board* more or less a slope, you may be accommodated with a Notch or Tooth to set it at. This *Swash-Board* hath an Hole made about its Center, to slip over the *Iron Axis*: And being thus slipped over the *Iron Axis*, you set it to that Slope you intend the *Swash* on your Work shall

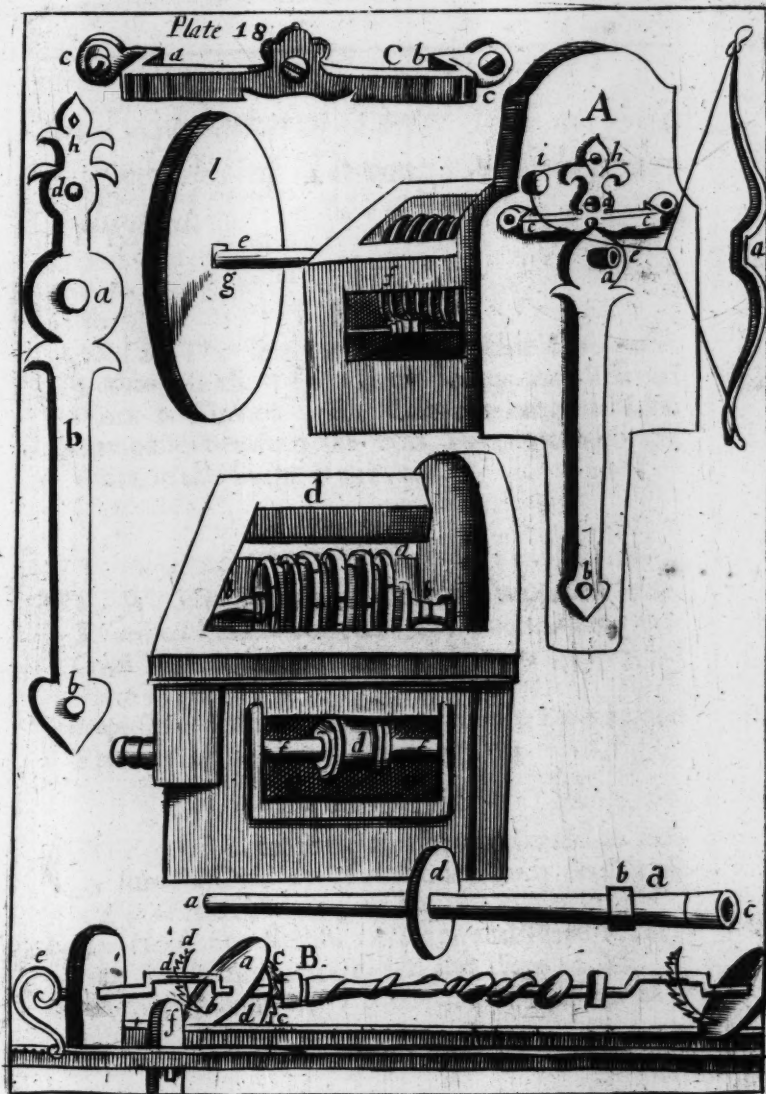
shall have. And to fix it fast in this position, you must put the Blades of the Quadrants into two *Slits* made in the *Iron Axis* as at *d d*, and fit the two opposite Teeth against the two outer Shoulders of the *Slits*.

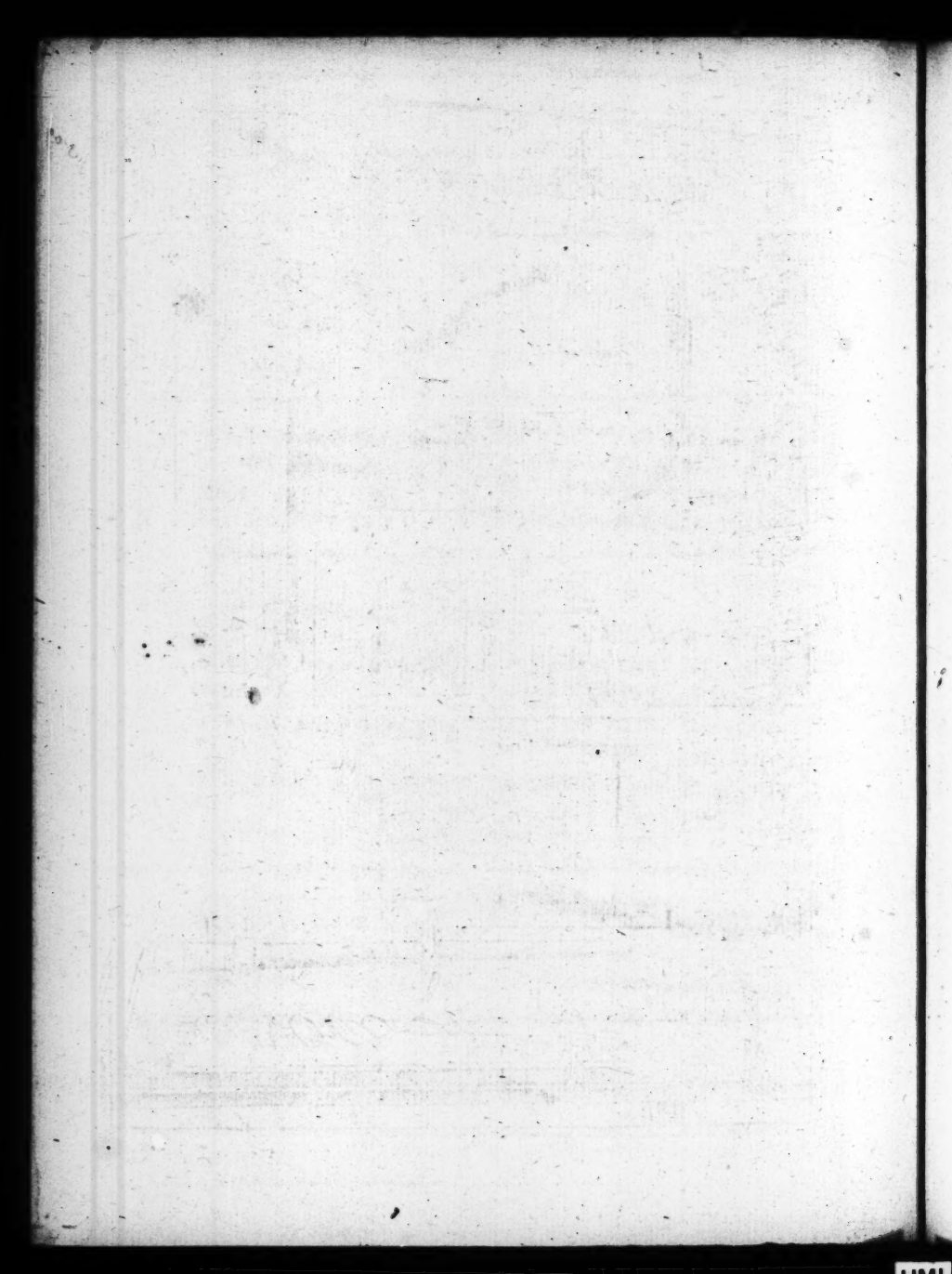
You must moreover make two strong *Steel Springs* as at *c c*, to reach from the bottom of the outer sides of the *Puppets*, being strong nailed, or rather screwed down there, which must reach up so high as the *Axis*. And in the inner sides of these *Springs* must be made two Center holes for the points of the *Axis* to be fitted in: For the *Oval Guide* being fitted to one end of the *Axis*, and a *Low-Puppet*, as at *f*, wedged close to one side of the *Swash-Board*, when the *Swash-Board* stands in its greatest declivity; Then in a Revolution of the *Axis*, as the farther part of the Circumference of the *Swash-board* comes to the *Low-Puppet*, one Spring will be forced backwards, and the other will spring forwards; and an Edg'd-Tool held against the Work fixed on the *Axis*, will make on the Work the Form of a *Swash*, &c.

These *Oval-Engines*, *Swash-Engines*, and all other *Engines*, are excellently well made by Mr. *Thomas Oldfield*, at the sign of the *Flower-de-luce*, near the *Savoy* in the *Strand*, *London*.

Thus much of *Turning*: My next *Exercises* will (God willing) be upon the *Art of Printing*.

Ap





309

*An Explanation of Terms used in these
Exercises of Turning, Alphabetically
digisted.*

A.

AXIS. The imagined straight Line that passes through the two Center-points that Turned Work is Turned upon. Thus the imagined Line that passes between the two Pikes through the Work in the Lathe is the Axis. !

B.

BOW. The Bow that Common Turners use is described Numb. 10. § 1. ¶ 11. And the Bow that Oval Turners use is described Numb. 14. § 23. and Plate 17, 18. at *a*.

Button. The Button is described Numb. 14. § 23. and Plate 17. at *b*.

C.

CALLIPPERS. Compasses with bowed shanks to measure the Diameter of any round Body. See Numb. 12. § 11. and Plate 14. at *O*.

Center-Head. See Numb. 14. § 23. and Plate 17. at *g*.

Cheeks. See Numb. 10. § 1. ¶ 2. and Plate 12. *b b*.

Chock. See Numb. 11. § 6. ¶ 5. and Plate 13. at *F*

5. *a*.

L 1

Cleaving-

Cleaving-knife. See Numb. 12. § 9. and Plate 13. at M.

Crank. The end of an Iron Axis turned Square down, and again turned Square to the first turning down, so that on the last turning down a Leather Thong is slip't, to Tread the Treddle-wheel about.

Collar. See Numb. 11. § 7. and Plate 13. at G.H.I.

Crook. See *Crank.*

Cross-Treddle. See Numb. 10. § 1. ¶ 8. and Plate 12. at k.

D.

D *Rill-Barrel.* See Numb. 1. Fol. 6. Plate 1. and Fig. 8. at C.

Drill-Bench. See Numb. 12. § 12. Plate 14. at a a a a.

Drill-Bow. See Numb. 1. Fol. 6, 7.

F.

F *Female Screw.* The Screw made in the round Hole of a Nut.

Flat-Chissel. See Numb. 11. § 3. and Plate 15. at C C.

Flat-Mandrel. See Numb. 11. § 6. and Plate 13. at E 1.

G.

G *Onge.* See Numb. 10. § 2. ¶ 1. and Plate 15. at B-B.

Great Wheel. See Numb. 10. § 1. ¶ 12. and Plate 14. at a.

Grooving Hooks. See Numb. 11. § 5. and Plate 15. at E.

Grooving Tools. See *Grooving Hooks.*

Guide. See Numb. 14. § 23. ¶ 4. and *Plate* 18.

Guide-Pulley. See Numb. 14. § 23. ¶ 4. and *Plate* 18.
at *d*.

H.

H*Ead.* See Numb. 14. § 23. and *Plate* 17. at *f*.

Hook. See Numb. 13. § 17. and *Plate* 16. at B. 1.
B 2. B 3.

Hollow Axis. See Numb. 17. § 17. and *Plate* 17. at *e*.

Hollow Mandrel. See Numb. 11. § 6. ¶ 3. and *Plate*
13. at F 3.

I.

J*oynt Collar.* See Numb. 11. § 7. and *Plate* 13.
at G.

L.

L*Athe.* See Numb. 10. § 1. and *Plate* 12.

Legs. See Numb. 10. § 1. and *Plate* 12. at *aaaa*.

M.

M*Andrel.* See Numb. 11. § 6. ¶ 1. and *Plate* 13.
at F 1. F 2. F 3. F 4.

Mawl. See Numb. 12. § 8. and *Plate* 13. at K.

Male-Screw. The Screw made upon a Shank or Pin.

Moving Collar. See Numb. 14. § 23. ¶ 2. and *Plate*
18. at *b*.

N.

N*UT.* A piece of Iron that a Female Screw is
made in.

P.

Pike. See Numb. 10. § 1. ¶ 5. and Plate 12.

Pin-Mandrel. See Numb. 11. § 6. ¶ 2. and Plate 13. at F 2.

Pole. See Numb. 10. § 1. ¶ 9. and Plate 12. at l.

Puppet. See Numb. 10. § 1. ¶ 3. and Plate 12. at c c.

R.

Rest. See Numb. 10. § 1. ¶ 6. and Plate 12. at e.

Rowler. See Numb. 11. § 6. and Plate 13. F 1. at b.

S.

Screw-Mandrel. See Numb. 11. § 6. ¶ 4. and Plate 13. at F 4.

Seat. See Numb. 10. § 1. ¶ 15.

Shackles. See Numb. 14. § 23. ¶ 2. and Plate 18. V at c c.

Side-Rest. See Numb. 10. § 1. ¶ 7. and Plate 13. at e.

Socket. See *Chock*.

Steel-Bow. See Numb. 14. § 23. and Plate 18. at a.

Stop-Screw. See Numb. 14. § 23. and Plate 17. at d.

String. See Numb. 10. § 1. and Plate 12. at m.

String-Pulley. See Numb. 14. § 23. and Plate 17. at i.

Swash. A *Swash* is a Figure whose Circumference is not Round, but Oval; and whose Moldings lye not at Right Angles, but Oblique to the *Axis* of the Work. See Numb. 14. § 25. and Plate 18. at Fig. B.

Swash-Board. See Numb. 14. § 25. and Plate 18. at a in Fig. B.

Sweep.

Sweep. See Numb. 13. § 19. and *Plate* 16. at D.

T.

T*Read.* See Numb. 12. § 13. Fol. 209.

Treddie. See Numb. 10. § 1. and *Plate* 12. at i.

Treddie-Wheel. See Numb. 10. § 1, ¶ 13.

Turn-Bench. See Numb. 13. § 18. and *Plate* 16. at C.

W.

W*Abble.* When a piece of Work is not pitch true upon its Centers, it will in a Revolution incline more on one side of its Circumference than on its opposite side. See Numb. 14. § 23. and *Plate* 17. at k.

There are several other Terms used in these *Exercises* of *Turning* not explain'd here: But because they are used in some of the former *Exercises*, and there explain'd, I shall refer you to them.

The End of the First Volume.

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FOL. 183. at ¶ 10. for Side-Rest r. Side-Pole. f. 186. l. 13. for Ruler r. Rowler. f. 191. l. 18. for Corner r. Convex. fol. 197, 198, 199, 200. throughout these Pages, for Plate 15. r. Plate 13. f. 126. l. 14. for marked in Plate. r. marked D. in Plate.



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Applied to the Art of

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The Second VOLUME.

By *Joseph Moxon*, Member of the Royal Society, and *Hydrographer* to the King's Most Excellent Majesty.

LONDON.

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Of the Doctrine of

Isidore Loebl

Isidore

The Second VOLUME

By Joseph Meyer, Member of the
Society, and Historian of the
Most Excellent Majesty.

LONDON

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To the Right Reverend Father in GOD,
JOHN Lord Bishop of Oxford, and
Dean of Christ-Church; And to the
Right Honourable Sir LEOLINE
JENKINS Knight, and Principal
Secretary of State; And to the Right
Honourable Sir JOSEPH WILLIAM-
SON Knight; and one of His Majesties
most Honourable Privy-Council.

Right Honourable.

Y Our ardent affections to promote
Typographic has eminently ap-
peared in the great Charge you
have been at to make it famous
here in England; whereby this Royal Island
stands particularly obliged to your Generous
and Publick Spirits, and the whole Common-
Wealth of Book-men throughout the World,
to your Candid Zeal for the promulgation of
good Learning.

Wherefore I humbly Dedicate this Piece
of Typographic to your Honours; and

as it is (I think) the first of this nature, so I hope you will favourably excuse small Faults in this Undertaking; for great ones I hope there are none, unless it be in this presumptuous Dedication; for which I humbly beg your Honours pardon: Subscribing my self, My Lord and Gentlemen,

Your Honours most Humble
and Obedient Servant.

Joseph Moxon.

MECHANICK



*The true Effigies of Iohn Guttemberg Delineated from
the Original Painting at Mentz in Germanie.*



*The true Effigies of Laurenz Ians. Kofler Delineated
from his Monumentall Stone Statue, Erected at
Harlem.*



MEMORIA
SACRVM.

LAVRENTIO
COSTERO,
HARLEMENSI,
ALTERI CADMO,
ET ARTIS
TYPOGRAPHICÆ
CIRCA AN. DOM.
M. CCCC. XXX.
INVENTORI
PRIMO,

BENE DE LITERIS
AC TOTO ORBE
MERENTIBUS
Q. I. C. Q.

STATVAM OVIA
AREA AVT MAR-
MOREA DE PVIT-
TROMONVMEN-
TO POSVIT CIVIS
GRATIS SIMVS

PETRVS
SCRIVERIVS

1635.

A

MECHANICK EXERCISES:

Or, the Doctrine of

Handy-works.

Applied to the Art of

Printing.**The Second VOLUME.**

P R E F A C E.

Before I begin with *Typographie*, I shall say some-what of its *Original Invention*; I mean here in Europe, not of theirs in China and other Eastern Countries, who (by general assent) have had it for many hundreds of years, though their *Invention* is very different from ours; they Cutting their Letters upon Blocks in whole Pages or Forms, as among us our Wooden Pictures are Cut; But Printing with single Letters Cast in Metall, as with us here in Europe, is an *Invention* scarce above Two hundred and fifteen years old; and yet an undecidable Controversie about the original Contriver or Contrivers remains on foot,

B

between

between the Harleimers of Holland, and those of Mentz in Germany: But because the difference cannot be determin'd for want of undeniable Authority, I shall only deliver both their Pleas to this Scientifick Invention.

The Harleimers plead that Lawrenz Janisz Koster of Harlem was the first Inventer of Printing, in the year of our Lord 1430. but that in the Infancy of this Invention he used only Wooden Blocks (as in China, &c. aforesaid) but after some time he left off Wood, and Cut single Letters in Steel, which he sunk into Copper Matrices, and fitting them to Iron Molds, Cast single Letters of Mettal in those Matrices. They say also, that his Companion, John Gutenberg, stole his Tools away while he was at Church, and with them went to Mentz in Germany, and there set his Tools to work, and promoted His claim to the first Invention of this Art, before Koster did His.

To prove this, they say that Rabbi Joseph (a Jew) in his Chronicle, mentions a Printed Book that he saw in Venice, in the year 5188. according to the Jewish Account, and by ours the year 1428. as may be read in Pet. Scriverius.

They say much of a Book intituled De Spiegel, Printed at Harlem in Dutch and Latin; which Book is yet there to be seen: and they alledge that Book the first that ever was Printed: But yet say not when this Book was Printed.

Notwithstanding this Plea, I do not find (perhaps because of their imperfect Proofs) but that Gutenberg of Mentz is more generally accepted for the first Inventer of Printing, than Koster of Harlem.

The Learned Dr. Wallis of Oxford, hath made an Inquiry into the original of this Invention, and hath in brief sum'd up the matter in these words.

About

About the year of our Lord 1460. The Art of *Printing* began to be invented and practised in *Germany*, whether first at *Mentz* or first at *Harlem* it is not agreed: But it seems that those who had it in consideration before it was brought to perfection, disagreeing among themselves, did part Company; and some of them at *Harlem*, others at *Mentz* pursued the design at the same time.

The Book which is commonly reputed to have been first Printed is, Tullies Offices, of which there be Copies extant (as a Rarity) in many Libraries; which in the close of it is said to be Printed at Mentz, in the year of our Lord 1465. (so says that Copy in the Bodleyan Library) or 1466. (so that in the Library of Corpus Christi.) The words in the close of that in Corpus Christi Colledge Oxon are these,

Præsens Marcij Tullij Clarissimum opus, Johannes Hust, Moguntinus Civis, non Atrimento, plumbali canna, neq; ærea, sed Arte quadam perpulchra, Petri manu Petri de Genshem pueri mei, feliciter effecti, finitum Anno MCCCCCLXVI quarto die Mensis Februarij.

The like in the Bodleyan Library; save there the Date is only thus; Finitum Anno MCCCCCLXV. In the same Book there are these written Notes subjoyned: Hic est ille Johannes Faustus, coadjutor Johannes Gutenbergij primi Typographiæ inventaris, Alter coadjuto erat Petrus Schæfer, i. Opilio. Quovix.

Celando promptior alter erat, inquit Johan. Arnoldus in Libello de Chalcographiæ inventione, Schæffer primas finxit quas vocant Matrices. Hi tres exercuerunt artem primo in communi, mox rupto fœdere, seorsim sibi quisq; privatim.

And again (in a later hand) Inventionem artis Typographicæ ad Annum 1453. aut exerciter referunt Sabillicus En. 10. lib. 6. & Monſterus. Alij ad Annum 1460. Vi. de Polid. Virg. lib. 2. de Invent. Rerum, Theod. Bibland. de Ratione communis linguarum. cap. de Chalcographia.

At Harlem and ſome other places in Holland, they pretend to have Books Printed ſomewhat ancients than this; but they are moſt of them (if not all) done by way of Carving whole Pages in Wood, not by ſingle Letters Caſt in Metall, to be Compoſed and Diſtributed as occaſion ſerves, as is now the manner.

The chief Inventaer at Harlem is ſaid to be Laurens Janſz Koſter.

After theſe two places (Mentz and Harlem) it ſeems next of all to have been practiſed at Oxford: For by the care, and at the charge of King Henry the 6th, and of Thomas Bouchier then Arch-Biſhop of Canterbury (and Chancellour of the Univerſity of Oxford) Robert Turner Maſter of the Robe, and William Caxton a Merchant of London were for that purpoſe ſent to Harlem, at the charges partly of the King, partly of the Arch-Biſhop, who then (becauſe theſe of Harlem were very chary of this ſecret) prevailed privately with one Frederick Corſeles an under-Workman, for a ſum of Money, to come over hither; who thereupon did at Oxford ſet up the Art of Printing, before it was exerciſed any where elſe in England, or in France, Italy, Venice, Germany, or any other place, except only Mentz and Harlem (aforementioned): And there be ſeveral Copies yet extant (as one in the Archives of the Univerſity of Oxford, another in the Library of Dr. Tho. Barlow, now Biſhop of Lincoln) of a Treatiſe of

of St. Jerome (as it is there called (because found among St. Jerom's Works) or rather Ruffinus upon the Creed, in a broad Octavo) Printed at Oxford in the year 1468. as appears by the words in the close of it.

Explicit expositio Sancti Jeronimi in sembolo Apostolorum ad papam Laurentium Impressi Oxonie & finita Anno Domini MCCCC LXVIII. xvij die Decembris.

Which is but three years later than that of Tullies Offices at Mentz, in 1465. and was perhaps one of the first Books Printed on Paper; (that of Tully being on Vellom.) And there the exercise of Printing hath continued successively to this day.

Soon after William Caxton (the same I suppose who first brought it to Oxford) promoted it to London also, which Baker in his Chronicle (and some others) say to have been about the year 1471. but we have scarce any Copies of Books there Printed remaining (that I have seen) earlier than the year 1480. And by that time, or soon after, it began to be received in Venice, Italy, Germany, and other places, as appears by Books yet extant, Printed at divers places in those Times. Thus far Dr. Wallis.

But whoever were the Inventers of this Art, or (as some Authors will have it) Science ; nay, Science of Sciences (say they) certain it is, that in all its Branches it can be deemed little less than a Science : And I hope I say not to much of Typographie : For Dr. Dee, in his Mathematical Preface to Euclids Elements of Geometrie, hath worthily taken pains to make Architecture a Mathematical Science ; and as a vertual Proof of his own Learned Plea, quotes two Authentique Authors, viz.

Vitruvius and Leo Baptista, who both give their descriptions and applause of Architecture: His Arguments are somewhat copious, and the Original easily procurable in the English Tongue; therefore instead of transcribing it, I shall refer my Reader to the Text it self.

Upon the consideration of what he has said in behalf of Architecture, I find that a Typographer ought to be equally qualified with all the Sciences that he comes an Architect, and then I think no doubt remains that Typographie is not also a Mathematical Science.

For my own part, I weighed it well in my thoughts, and find all the accomplishments, and some more of an Architect necessary in a Typographer: and though my business be not Argumentation, yet my Reader, by perusing the following discourse, may perhaps satisfy himself, that a Typographer ought to be a man of Sciences.

By a Typographer, I do not mean a Printer, as he is Vulgarly accounted, any more than Dr. Dee means a Carpenter or Mason to be an Architect: But by a Typographer, I mean such a one, who by his own Judgement, from solid reasoning with himself, can either perform, or direct others to perform from the beginning to the end, all the Handy-works and Physical Operations relating to Typographie.

Such a Scientifick man was doubtless he who was the first Inventaer of Typographie; but I think few have succeeded him in Science, though the number of Founders and Printers be grown very many: Inasmuch that for the more easie managing of Typographie, the Operators have found it necessary to divide it into several Trades, each of which (in the strictest sence) stand nearer

nearer related to Typographie, than Carpentry or Masonry, &c. are to Architecture. The several divisions that are made, are,

First The Master Printer, who is as the Soul of Printing; and all the Work-men as members of the Body governed by that Soul subserveient to him; for the Letter-Cutter would Cut no Letters, the Founder not sink the Matrices, or Cast and Dress the Letters, the Smith and Joyner not make the Press and other Utensils for Printing, the Compositor not Compose the Letters, the Correcter not read Proves, the Press-man not work the Forms off at the Press, or the Inck-maker make Inck to work them with, but by Orders from the Master-Printer.

Secondly, The Letter-Cutter,

Thirdly, The Letter-Caster,

Fourthly, The Letter-Dresser.

} **Founders.**

But very few Founders exercise, or indeed can perform all these several Trades; though each of these are indifferently called Letter-Founders.

Fifthly, The Compositor,

Sixthly, The Correcter,

} **Printers.**

Seventhly, The Press-man,

Eighthly, The Inck-maker.

Besides several other Trades they take in to their Assistance; as the Smith, the Joyner, &c.

ADVER

ADVERTISEMENT.

THE continuation of my setting forth *Mechanick Exercifes* having been obstructed by the breaking out of the Plot, which took off the minds of my few Customers from buying them, as formerly; And being of late much importun'd by many worthy Persons to continue them; I have promised to go on again, upon Condition, That a competent number of them may be taken off my hand by Subscribers, soon after the publication of them in the *Gazet*, or posting up Titles, or by the *Mercurius Librarius*, &c.

Therefore such Gentlemen or others as are willing to promote the coming forth of these *Exercifes*, are desired to Subscribe their Names and place of abode: That so such Persons as live about this City may have them sent so soon as they come forth: Quick Sale being the best encouragement.

Some Gentlemen (to whom they are very acceptable) tell me they will take them when all *Trades* are finish'd, which cannot reasonably be expected from me (my Years considered) in my life-time; which implies they will be Customers when I'me dead, or perhaps by that time some of themselves.

The price of these Books will be 2 *d.* for each Printed Sheet. And 2 *d.* for every Print taken off of Copper Cuts.

There are three reasons why this price cannot be thought dear.

1. The Writing is all new matter, not Collected, or Translated from any other Authors: and the drafts of the Cuts all drawn from the Tools and Machines used in each respective Trade.

2. I Print but 500 on each Sheet, And those upon good Paper: which makes the charge of Printing dear, proportionable to great numbers.

3. Some Trades are particularly affected by some Customers, (who desire not the rest,) and consequently sooner sold off, which renders the remainder of the un-sold *Exercifes* unperfect, and therefore not acceptable to such as desire all: so that they will remain as waste-Paper on my hands.

JOSEPH MOXON.



Plate 3.

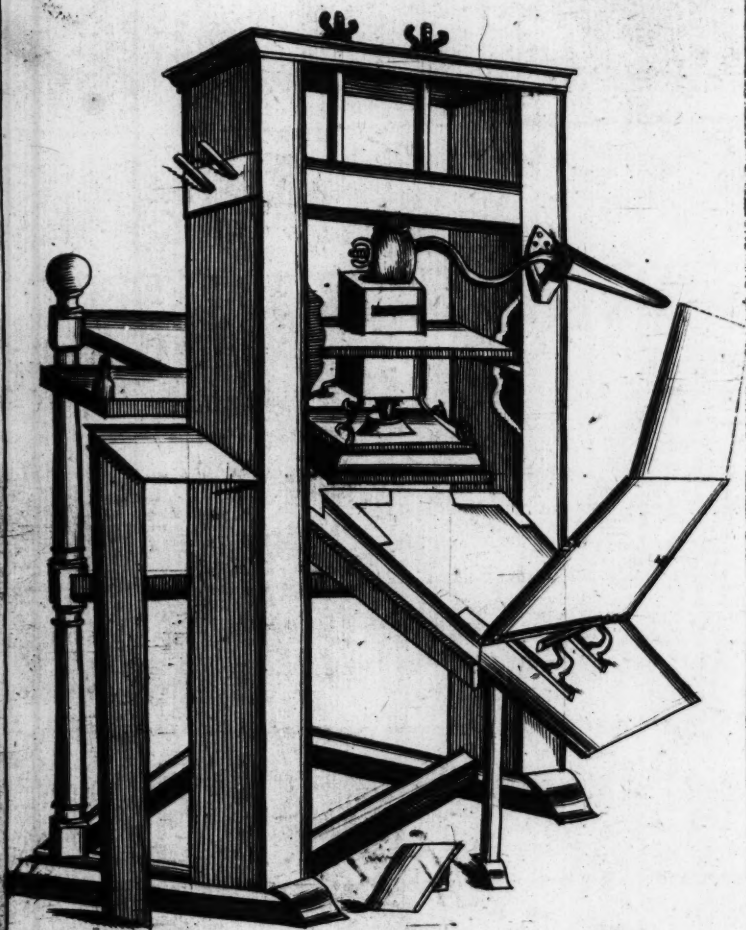


Plate 4.

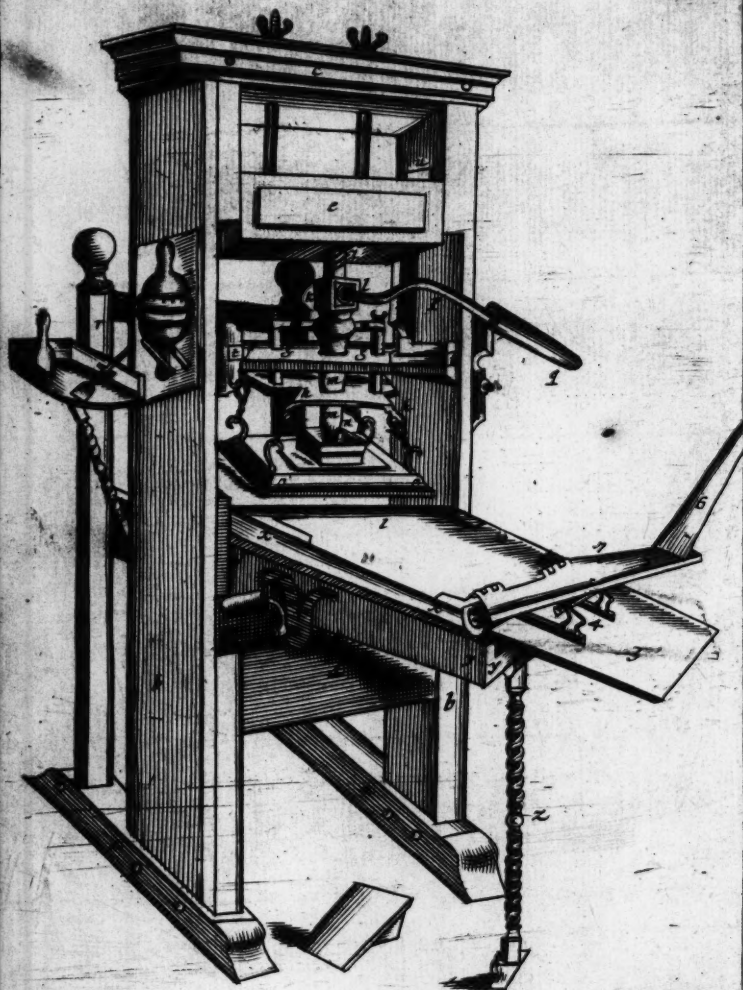


Plate 5.

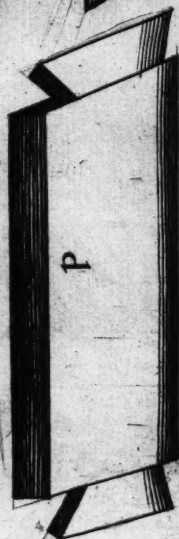
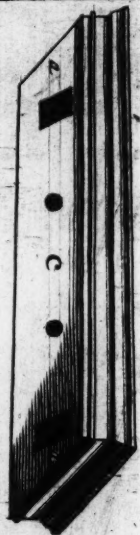
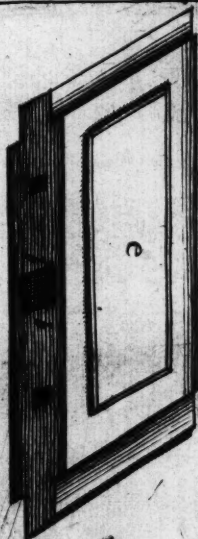
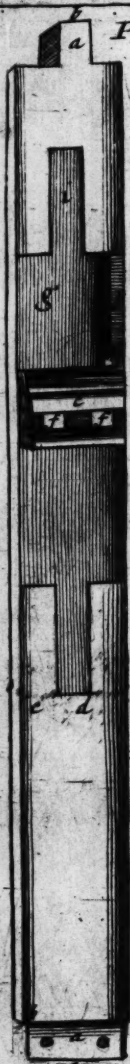
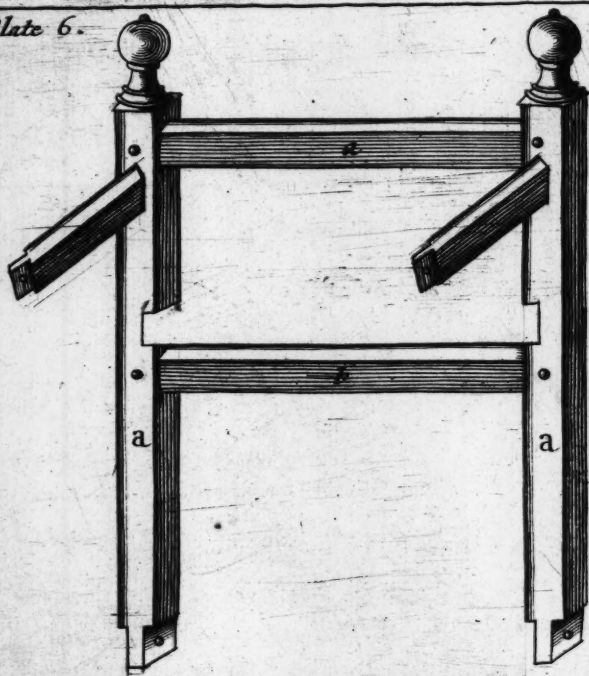


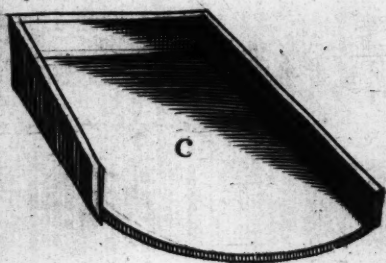
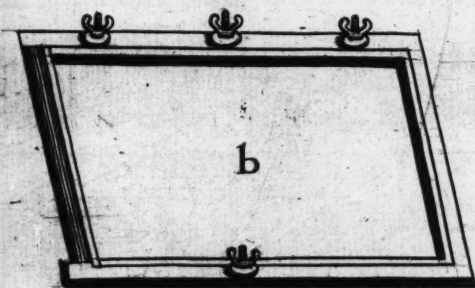
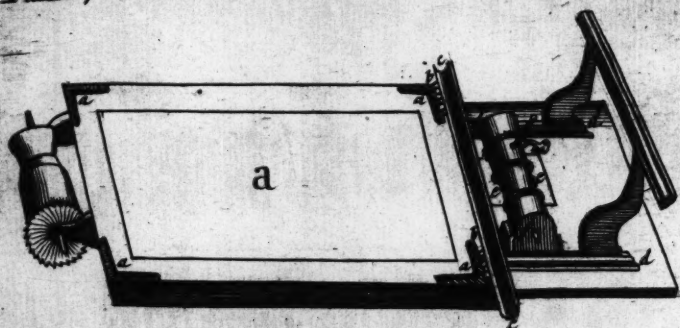
Plate 6.



b



Plate 7.



MECHANICK EXERCISES:

Or, the Doctrine of

Handy-works.

Applied to the Art of

Printing.

The Second VOLUME.

§ 2. Of the Office of a Master-Printer.

I Shall begin with the Office of a *Master-Printer*, because (as aforesaid) he is the Director of all the Work men, he is the Base (as the *Dutchmen* properly call him) on which the Workmen stand, both for providing Materials to Work withal, and successive variety of Directions how and in what manner and order to perform that Work.

His Office is therefore to provide a House, or Room or Rooms in which he is to let his *Printing-House*. This expression may seem strange, but it is *Printers Language*: For a *Printing-House* may admit of a twofold meaning; one the Vulgar acceptance,

and is relative to the House or Place wherein *Printing* is used; the other a more peculiar Phrase *Printers* use among themselves, viz. only the *Printing Tools*, which they frequently call a *Printing-House*: Thus they say, Such a One has set up a *Printing-House*, when as thereby they mean he has furnish'd a House with *Printing Tools*. Or such a one has remov'd his *Printing-House*, when thereby they only mean he has remov'd the Tools us'd in his former House. These expressions have been used Time out of mind, and are continued by them to this day.

But to proceed, Having consider'd what number of *Presses* and *Cases* he shall use, he makes it his business to furnish himself with a Room or Rooms well-lighted, and of convenient capacity for his number of *Presses* and *Cases*, allowing for each *Press* about Seven Foot square upon the Floor, and for every *Frame* of *Cases* which holds Two pair of *Cases*, viz. one pair *Romain* and one pair *Italica*, Five Foot and an half in length (for so much they contain) and Four Foot and an half in breadth, though they contain but Two Foot and Nine Inches: But then room will be left to pass freely between two *Frames*.

We will suppose he resolves to have his *Presses* and *Cases* stand in the same Room (though in *England* it is not very customary.) He places the *Cases* on that side the Room where they will most conveniently stand, so, as when the *Compositer* is at work the Light may come in on his Left-hand; for else his Right-hand plying between the Window-light and his Eye might shadow the *Letter* he would pick up: And the *Presses* he places so, as the Light may fall from a Window right

Right before the *Form* and *Tinpan*: And if situation will allow it, on the North-side the Room, that the *Press-men*, when at their hard labour in *Summer* time, may be the less uncommoded with the heat of the *Sun*: And also that they may the better see by the constancy of that Light, to keep the whole *Heap* of an equal Colour.

He is also to take care that his *Presses* have a solid and firm Foundation, and an even Horizontal Floor to stand on, That when the *Presses* are set up their Feet shall need no Underlays, which both damage a *Press*, are often apt to work out, and consequently subject it to an unstable and loose position, as shall further be shewn when we come to the Setting up of the *Press*.

And as the Foundation ought to be very firm, so ought also the Roof and Sides of the *Press Room* to be, that the *Press* may be fastned with Braces overhead and on its Sides, as well and steady as under foot.

He is also to take care that the Room have a clear, free and pretty lofty Light, not impeded with the shadow of other Houses, or with Trees; nor so low that the Sky light will not reach into every part of the Room: But yet not too high, lest the violence of *Winter* (*Printers* using generally but Paper windows) gain too great advantage of Freezing the Paper and Letter, and so both Work and Workman stand still. Therefore he ought to Philosophize with himself, for the making the height of his Lights to bear a rational proportion to the capacity of the Room.

Here being but two sides of the Room yet used,

he places the *Correcting-stone* against a good Light; and as near as he can towards the middle of the Room, that the *Compositers* belonging to each end of the Room may enjoy an equal access to it. But sometimes there are several *Correcting-stones* plac'd in several parts of the Room.

The *Lye-Trough* and *Rincing-Trough* he places towards some corner of the Room, yet so as they may have a good Light; and under these he causes a *Sink* to be made to convey the Water out of the Room. But if he have other conveniencies for the placing these Troughs, he will rather set them out of the Room to avoid the slabbering they cause in.

About the middle of the Room he places the *Distributing-Frame* (*viz.* the *Frame* on which the *Forms* are set that are to be *Distributed*) which may stand light enough, though it stand at some considerable distance from the Window.

In some other empty place of the Room (least frequented) he causes so many *Nest-Frames* to be made as he thinks convenient to hold the *Cases* that may lye out of present use; and the *Letter-boards* with *Forms* set by on them, that both the *Cases* and the *Forms* may be the better secured from running to *Pye*.

Having thus contriv'd the several Offices of the Room, He furnishes it with *Letters*, *Presses*, *Cases*, *Chases*, *Furniture*, &c. Of each of which in Order.

¶ 2. Of Letter.

He provides a *Fount* (properly a *Fund*) of *Letter* of all *Bodies*; for most *Printing-Houses* have all except the two first, viz. *Pearl*, *Nomparel*, *Brevier*, *Long-Primmer*; *Pica*, *English*, *Great Primmer*, *Double-Pica*, *Two Lin'd English*, *Great-Cannon*.

These are the *Bodies* most of use in *England*; But the *Dutch* have several other *Bodies*: which because there is little and almost no perceivable difference from some of these mentioned, I think they are not worth naming. Yet we have one *Body* more which is sometimes used in *England*; that is a *Small Pica*, but I account it no great discretion in a *Master-Printer* to provide it; because it differs so little from the *Pica*, that unless the *Workmen* be carefuller than they sometimes are, it may be mingled with the *Pica*, and so the Beauty of both *Founts* may be spoil'd.

These afore said *Bodies* are commonly *Cast* with a *Romain*, *Italica*, and sometimes an *English Face*. He also provides some *Bodies* with the *Musick*, the *Greek*, the *Hebrew*, and the *Syriack Face*: But these, or some of these, as he reckons his opportunities may be to use them.

And that the Reader may the better understand the sizes of these several *Bodies*, I shall give him this *Table* following; wherein is set down the number of each *Body* that is contained in one *Foot*.

<i>Pearl,</i>	184	} contained in one Foot.
<i>Nomparel,</i>	150	
<i>Brevier,</i>	112	
<i>Long-Primmer,</i>	92	
<i>Pica,</i>	75	
<i>English,</i>	66	
<i>Great-Primmer,</i>	50	
<i>Double-Pica,</i>	38	
<i>Two-Lin'd English,</i>	33	}
<i>Great-Cannon.</i>	17½	

His care in the choice of these *Letters* are,

First, That the *Letter* have a true shape: Which he may know, as by the §. of *Letter-Cutting*.

I confess this piece of Judgement, *viz.* knowing of true Shape, may admit of some controversy; because neither the Ancients whom we received the knowledge of these *Letters* from, nor any other authentick Authority have delivered us Rules, either to make or know true shape by: And therefore it may be objected that every one that makes *Letters* but tolerably like *Romain*, *Italick*, &c. may pretend his to be true shap'd.

To this I answer, that though we can plead no Ancient Authority for the shape of *Letters*, yet doubtless (if we judge rationally) we must conclude that the *Romain Letters* were Originally invented and contrived to be made and consist of Circles, Arches of Circles, and straight Lines; and therefore those *Letters* that have these Figures, either entire, or else properly mixt, so as the Course and Progress of the Pen

Pen may best admit, may deserve the name of true Shape, rather than those that have not.

Besides, Since the late made *Dutch-Letters* are so generally, and indeed most deservedly accounted the best, as for their Shape, consisting so exactly of Mathematical Regular Figures as aforesaid, And for the commodious Fatness they have beyond other *Letters*, which easing the Eyes in Reading, renders them more Legible ; As also the true placing their Fats and their Leans, with the sweet driving them into one another, and indeed all the accomplishments that can render *Letter* regular and beautiful, do more visibly appear in them than in any *Letters* Cut by any other People : And therefore I think we may account the Rules they were made by, to be the Rules of true shap'd *Letters*.

For my own part, I liked their *Letters* so well, especially those that were Cut by *Christophel Van Dijk* of *Amsterdam*, that I set my self to examine the Proportions of all and every the parts and Members of every *Letter*, and was so well pleased with the Harmony and Decorum of their Symetrie, and found so much Regularity in every part, and so good reason for his Order and Method, that I examined the biggest of his *Letters* with Glasses, which so magnified the whole *Letter*, that I could easily distinguish, and with small Dividers measure off the size, scituation and form of every part, and the proportion every part bore to the whole ; and for my own future satisfaction collected my Observations into a Book, which I have inserted in my *Exercises* on *Letter-Cutting*. For therein I have exhibited to
the

the World the true Shape of *Christophel Van Dijcks* aforesaid *Letters*, largely Engraven in Copper Plates.

Whence I conclude, That since common consent of Book men assign the Garland to the *Dutch-Letters* as of late *Cut*, and that now those *Letters* are reduced unto a Rule, I think the Objection is Answered; And our *Master Printers* care in the choice of good and true shap'd *Letters* is no difficult Task: For if it be a large Bodied *Letter*, as *English*, *Great-Primmer* and upwards, it will shew it self; and if it be small, as *Pearl*, *Nomparel*, &c. though it may be difficult to judge the exact Symetry with the naked Eye, yet by the help of a *Magnifying-Glass* or two if occasion be, even those small *Letters* will appear as large as the biggest Bodied *Letters* shall to the naked Eye: And then it will be no difficult Task to judge of the Order and Decorum even of the smallest Bodied *Letters*. For indeed, to my wonder and astonishment, I have observ'd *V. Dijcks Pearl Dutch Letters* in Glasses that have Magnified them to great *Letters*, and found the whole Shape bear such true proportion to his great *Letters*, both for the *Thickness*, *Shape*, *Fats* and *Leans*, as if with Compasses he could have measur'd and set off in that small compass every particular Member, and the true breadth of every *Fat* and *Lean Stroak* in each *Letter*, not to exceed or want (when magnified) of *Letter Cut* to the *Body* it was Magnified to.

His second care in the choice of *Letters* is, That they be deep *Cut*; for then they will *Print* clear the longer, and be less subject to entertain *Picks*.

His third care; That they be deep sunk in the
Matrices,

Matrices least the bottom line of a *Page* Beard. Yet though they be deep sunk, His care ought to be to see the Beard also well cut off by the *Founder*.

And a Fourth Care in the choice of *Letter* is, That his *Letter* be Cast upon good Mettal, that it may last the longer.

Of each Body he provides a *Fount* suitable to such sorts of Work as he designs to do ; But he provides not an equal waight of every *Fount* ; Because all these Bodies are not in equal use : For the *Long-Primmer*, *Pica* and *English* are the Bodies that are generally most used ; And therefore he provides very large *Founts* of these, viz. of the *Long-Primmer* in a small *Printing-House*, Five hundred Pounds weight *Romain* and *Italica*, whereof One hundred and fifty Pounds may be *Italica*. Of the *Pica* and *English*, *Roman* and *Italica*, Eight, Nine hundred, or a Thousand Pounds weight : when as of other *Founts* Three or Four hundred Pounds weight is accounted a good *Fount* : And of the *Cannon* and *Great-Cannon*, One hundred Pounds or somewhat less may serve his turn ; Because the common use of them is to set Titles with.

Besides *Letters* he Provides Characters of *Astronomical* Signs, *Planets*, *Aspects*, *Algebraical* Characters, *Physical* and *Chimical* Characters, &c. And these of several of the most used Bodies.

He Provides also *Flowers* to set over the Head of a *Page* at the beginning of a Book : But they are now accounted old-fashion, and therefore much out of use. Yet *Wooden-Borders*, if well Drawn, and neatly Cut, may be Printed in a Creditable Book, As
also, D Wooden-

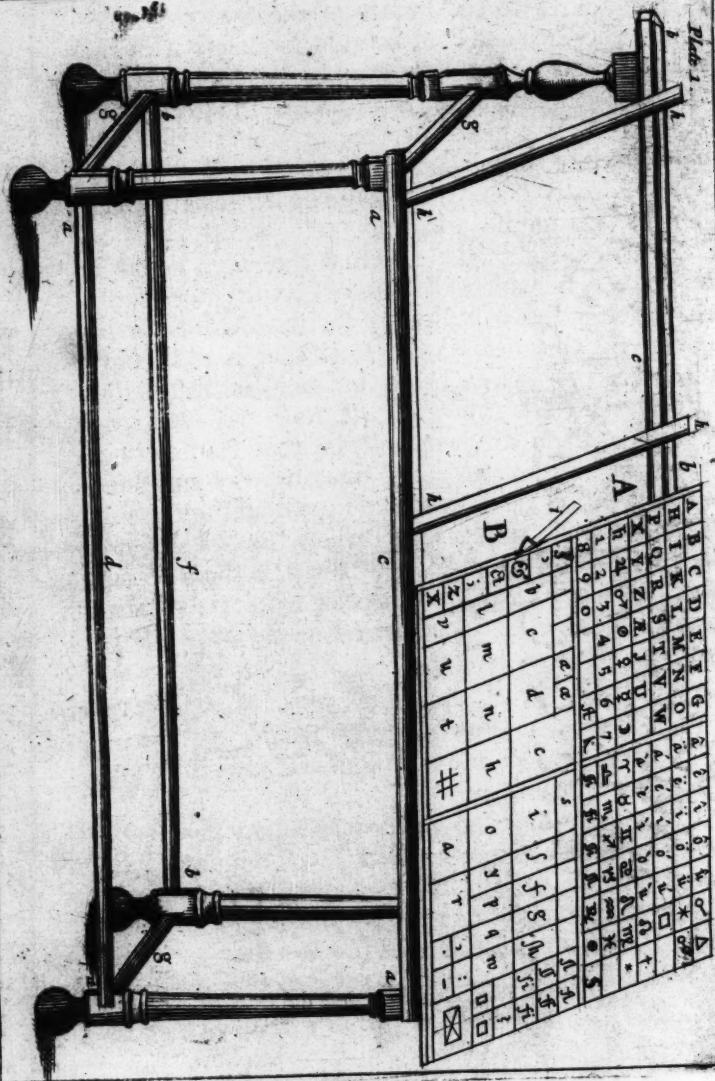
Wooden Letters well Drawn and neatly Cut may be used at the beinning of a *Dedication, Preface, Section, &c.* Yet instead of *Wooden Letters*, *Capitals* Cast in Metall generally now serves; because but few or good *Cutters* in *Wood* appear.

He also provides *Brass Rules* of about Sixteen Inches long, that the *Compositer* may cut them into such Lengths as his Work requires.

In the choice of his *Brass Rules*, he examines that they be exactly *Letter* high; for if they be much too high, they may cut through *Paper, Tinpan* and *Blankets* too; And if they be but a little too high, not only the Shoulder, or Beard, on either side them will *Print* black; but they will bear the *Plattin* off the *Letters* that stand near them, so that those *Letters* will not *Print* at all: And if they be too low, then the *Rules* themselves will not *Print*.

It sometimes happens through the unskilfulness of the *Joyner*, (for they commonly, but improperly, employ *Joyners* to make them) that a Length shall be hollow in the middle both on the Face and Foot, and shall run driving higher and higher towards both ends: Hence it comes to pass, that when the *Compositer* cuts a piece of *Rule* to his intended Length, the *Rule* shall *Print* hard at one end, and the other shall not *Print* at all; So that he shall be forced to knock up the foot of the low end, as shall be shewn in its proper place.

But the careful *Master-Printer* having found that his *Brass Rules* is *Letter* high all the whole Length, will also examine whether it be straight all the whole Length, which he does by applying both the
Face



Face and Foot to the surface of the *Correcting-stone*; And if the Face and Foot comply so closely with the *Correcting-stone*, that light cannot be seen between them, he concludes the *Brass-Rule* is straight.

Then he examines the Face or Edge of the *Rule*, whether it have an Edge of an equal breadth all the whole Length, and that the Edge be neither too thick nor too fine for his purpose.

He should also take care that the *Brass*, before it be cut out, be well and skilfully Planish't, nor would that charge be ill bestow'd; for it would be saved out of the thickness of the *Brass* that is commonly used; For the *Joyners* being unskilful in Planishing, buy Neal'd thick *Brass* that the *Rule* may be strong enough, and so cut it into slips without Hammering, which makes the *Rule* easily bow any way and stand so, and will never come to so good and smooth an Edge as Planish't *Brass* will. Besides, *Brass* well Planish't will be stiffer and stronger at half the thickness than unplanish't *Brass* will at the whole: As I shall further shew when I come to Exercise upon *Mathematical Instrument-making*.

§. 3. Of Cases.

Next he provides *Cases*. A Pair of *Cases* is an *Upper-Case* and a *Lower Case*.

The *Upper Case* and the *Lower-Case* are of an equal length, breadth and depth, viz. Two Foot nine Inches long, One Foot four Inches and an half broad, and about an Inch and a quarter deep, besides the bottom Board; But for small Bodied *Letters* they are made somewhat shallower, and for great Bodies deeper.

Long-Primmer and downwards are accounted small Bodies; *English* and upwards are accounted great Bodies.

The conveniencies of a shallow *Cafe* is, that the *Letters* in each Box lye more visible to the last, as being less shadowed by the sides of the *Boxes*.

The conveniencies of a deep *Cafe* is, that it will hold a great many *Letters*, so that a *Compositor* needs not so often *Des tribute*. 2dly. It is not so soon *Low*, (as *Compositors* say when the *Cafe* grows towards empty) and a *Low Cafe* is inconvenient for a *Compositor* to work at, partly because the *Cafe* standing inclining downwards towards them, the *Letters* that are in the *Cafe* tend towards the higher side of the *Cafe*, and are shadowed by the higher side of that *Box* they lye in, so that they are not so easily seen by the Eye, or so ready to come at with the Fingers, as if they lay in the middle of the *Box*.

These *Cases* are encompassed about with a *Frame* about Three quarters of an Inch broad, that the ends of the several partitions may be let into the substance of the *Frame*: But the highermost side of the *Frame* is about half an Inch higher than the other sides, that when either the *Galley* or another pair of *Cases* are set upon them, the bottom edge of the *Galley*, or of those *Cases* may stop against that higher *Frame*, and not slide off.

Both the *Upper* and the *Lower Cafe* have a thick Partition about three quarters of an Inch broad, Duff-tail'd into the middle of the upper and under Rail of the *Frame*. This Partition is made thus broad, that Grooves may be made on either side of it to receive

ceive

ceive the ends of those Partitions that deuide the breadth of the *Cafe*, and also to strengthen the whole *Frame*; for the bottom Board is as well nailed to this thick Partition as to the outer *Frame* of the *Cafe*.

But the deuisions for the several *Boxes* of the *Upper* and *Lower Cases* are not alike: for each half of the whole length of the *Upper-Cafe* is deuided into seven equal parts, as you may see in Plate 1. at A, and its breadth into seven equal parts, so that the whole *Upper-Cafe* is deuided into Ninety eight square *Boxes*, whose sides are all equal to one another.

But the Two halves of the length of the *Lower-Cafe* are not thus deuided; for each half of the length of the *Lower-Cafe* is deuided into Eight equal parts, and its breadth into Seven; but it is not throughout thus deuided neither; for then the *Boxes* would be all of equal size: But the *Lower-Cafe* is deuided into four several sizes of *Boxes*, as you may see in Plate 1. B.

The reason of these different sizes of *Boxes* is, That the biggest *Boxes* may be disposed nearest the *Composers* hand, because the English Language, and consequently all English *Coppy* runs most upon such and such Sorts; so that the *Boxes* that holds those Sorts ought to be most capacious.

His care in the choice of these *Cases* is, That the Wood they are made of be well-season'd Stuff.

That the Partitions be strong, and true let into one another, and that the ends fill up and stand firm in the Grooves of the *Frame* and middle *Rail* of the *Cafe*.

There is an inconuenience that often happens, these thin Partitions, especially if they be made of unseason'd Stuff. *viz.* as the Stuff dries it shrinks in the Grooves

Grooves of the *Frame*, and so not only grows loose, but sometimes starts out above the top of the *Frame*. To prevent this inconvenience, I have of late caused the ends of these thin partitions to be made Male-Duf-tails, broadest on the under side, and have them fitted into Female-Duf-tails in the *Frame* of the *Cafe*, and middle Rail before the bottom Boards are nailed on.

That the Partitions be full an *English* Body thick.

That the Partitions lye close to the bottom of the *Cafe*, that so the *Letters* slide not through an upper into an under *Box*, when the Papers of the *Boxes* may be worn.

§. 4. Of Frames to set the Cases on.

Frames are in most *Printing-Houses* made of thick Deal-board Battens, having their several Rails Tennanted into the *Stiles*: but these sorts of *Frames* are, in respect of their matter (*viz.* Fir) so weak, and in respect of their substance (*viz.* little above an Inch thick) so slight, that experience teaches us, when they are even new made, they tremble and totter, and having lasted a little while, the thinness of their *Tennants* being a little above a quarter of an Inch thick, according to the Rules of *Joyner*y, as I have shewn in Numb. 5. §. 17. They Craze, their *Tennants* break, or *Mortesses* split; and put the *Master-Printer* to a fresh Charge.

It is rationally to be imagined that the *Frames* should be designed to last as long as the *Printing house*; and therefore our *Master-Printer* ought to take care that they be made of matter strong enough, and of substance big enough to do the Service they are intended

for;

for; that they stand substantial and firm in their place, so as a small Jostle against them shake them not, which often reiterated weakens the *Frame-work*, and at that present is subject to shake the *Letter* in the *Galley* down.

I shall not offer to impose Rules upon any here, especially since I have no Authority from Prescript or Custom; yet I shall set down the Scantlings that I my self thought fit to use on this occasion. A Delination of the *Frames* are in Plate 1. at C.

a a a a The *Fore-Rails*.

b b b b The *Hind-Rails*.

c The *Top Fore-Rail*.

d The *Bottom-Fore-Rail*.

e The *Top Hind-Rail*.

f The *Bottom Hind-Rail*.

g g g g The *End-Rail*.

b b b b *Cross-Bearers*.

I made the *Rails* and *Stiles* of well-seasoned fine Oak, clean, (that is free from Knots and Shakes) the *Stiles* and *Rails* two Inches and an half square, the *Top* and *Bottom Fore-Rails* and the *Bottom Hind-Rail* four Foot three Inches long, besides their *Tenants*; And the *Top Hind Rail* five Foot three Inches long. The two *Fore-Rails* and *Bottom Hind-Rail* had Iron Female Screws let into them, which, through an hole made in the *Stiles*, received a Male-Screw with a long shank, and a Sholder at the end of it to screw them tight and firm together, even as the *Rails* of a *Bedsted* are screwed into the *Mortesses* of a *Bed-Post*. Each.

Each *Back Stile* was four Foot one Inch and an half high besides their *Tennants*, and each *Fore Stile* three Foot three Inches high; each *Fore* and *Back Stile* had two *Rails* one Foot seven Inches long; besides their *Tennants* Tennanted and Pin'd into them, because not intended to be taken assunder.

It must be considered, that the *Fore stiles* be of a convenient height for the pitch of an ordinary Man to stand and work at; which the height afore said is; And that the *Hind stiles* be so much higher than the *Fore-stiles*, that when the *Cross-Bearers* are laid upon the upper *Fore* and *Hind-Rail*, and the *Cases* laid on them, the *Cases* may have a convenient declivity from the upper side the *Upper-Case*, to the lower side the *Lower-Case*.

The Reason of this declivity is, because the *Cases* standing thus before the Workman, the farther *Boxes* of the *Upper-Case* are more ready and easie to come at, than if they lay flat; they being in this position somewhat nearer the hand, and the *Letters* in those *Boxes* somewhat easier seen.

If the Workman prove taller than Ordinary, he lays another or two pair of *Cases* under the *Cases* he uses, to mount them: If the Workman be short, as Lads, &c. He lays a *Paper-board* (or sometimes two) on the floor by the Fore-side of the *Frame*, and standing to work on it, mounts himself.

The *Bearers* are made of *Slit-Deal*, about two Inches broad, and so long as to reach from the *Fore-Rail* through the *Upper-Rail*, and are let in, so as to lye even with the superficies of the *Fore* and *Hind-Rail*, and at such a distance on both the *Rails*, as you may see in the Figure. On

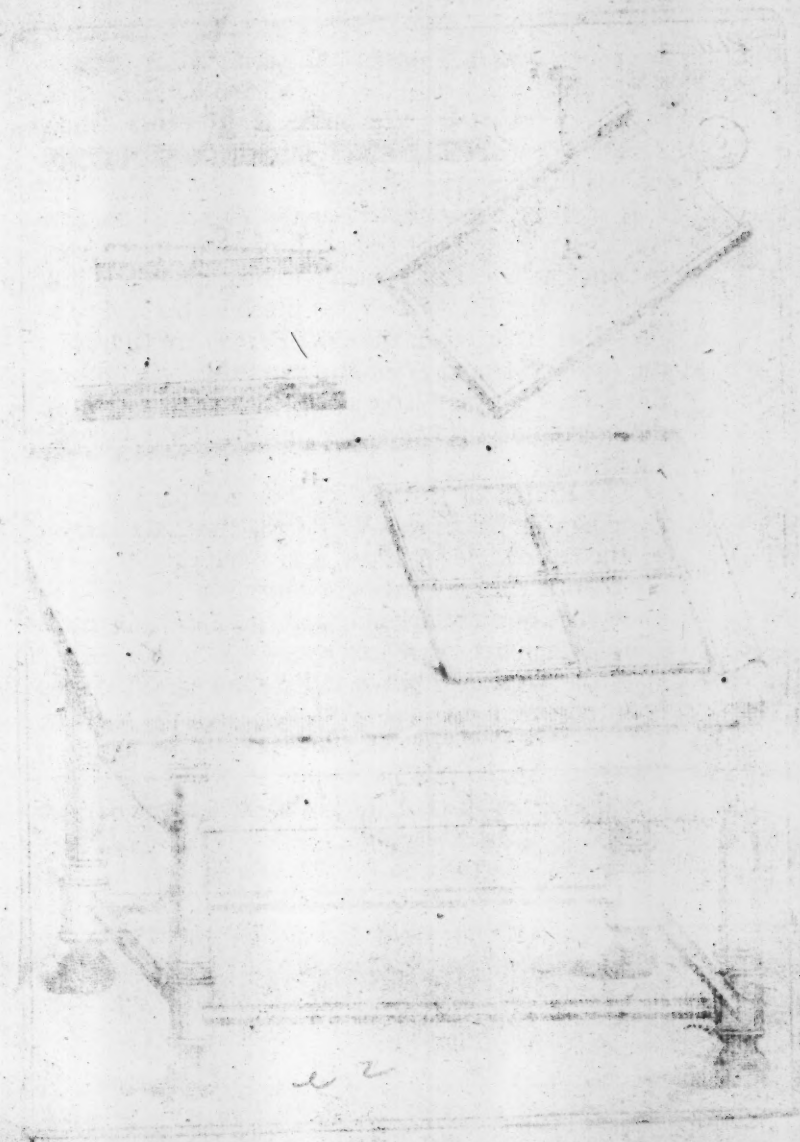
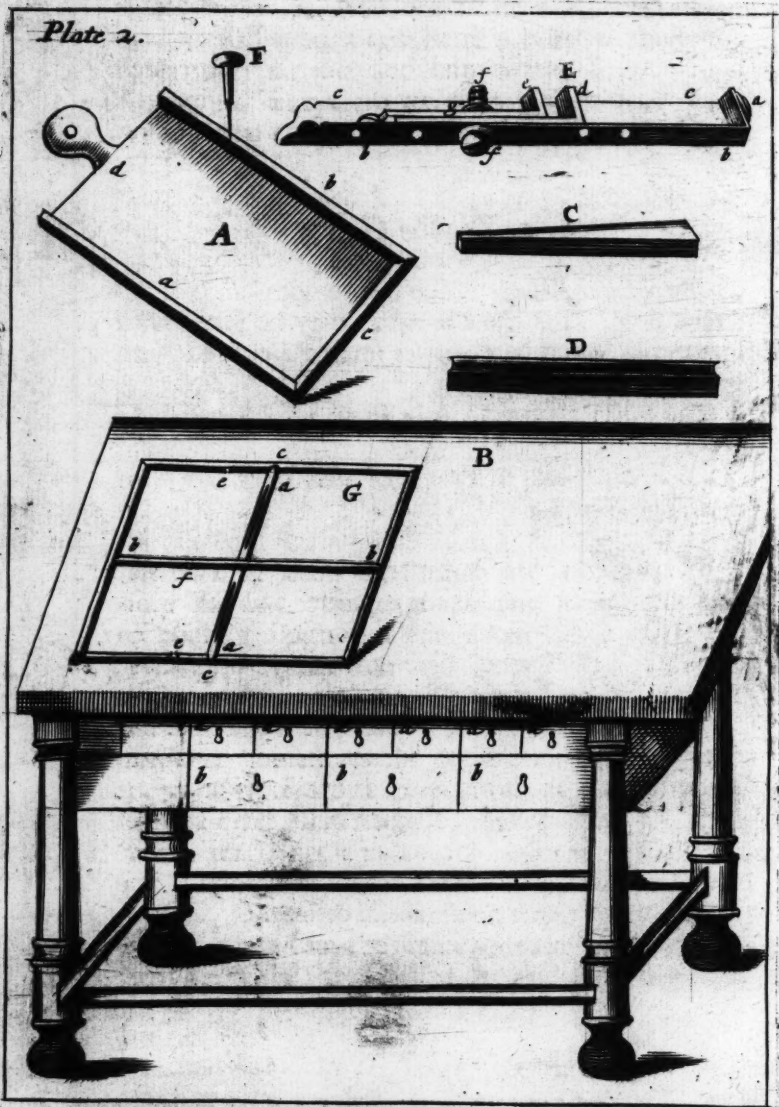


Plate 2.



On the Superficies of the *Fore-Rail*, even with its Fore-Edge is nailed a small *Riglet* about half an Inch high, and a quarter and half quarter of an Inch thick, that the *Cases* set on the *Frame* having the aforesaid declivity, may by it be stop't from sliding off.

§. 5. Of the Galley.

Our *Master-Printer* is also to provide *Galleys* of different sizes, That the *Compositor* may be suited with small ones when he *Composes* small *Pages*, and with great ones for great *Pages*.

The *Galley* is marked A in Plate 2.

a b c The Sides or Frame of the *Galley*.

d The *Slice*.

These *Galleys* are commonly made of two flat *Wainscot Boards*, each about a quarter and half quarter of an Inch thick, the uppermost to slide in Grooves of the *Frame*, close down to the undermost, though for small *Pages* a single Board with two sides for the *Frame* may serve well enough: Those *Wainscot Boards* are an Oblong Square, having its length longer than its breadth, even as the form of a *Page* hath. The three Sides of the *Frame* are fixed fast and square down on the upper Plain of the undermost Board, to stand about three fifth parts of the height of the *Letter* above the superficies of the *Slice*. The Sides of the *Frame* must be broad enough to admit of a pretty many good strong *Daken-Pins* along

the Sides, to be drove hard into the Bottom Board, and almost quite through the Sides of the Frame, that the Frame may be firmly fixed to it: But by no means must they be Glewed on to the Bottom Board, because the *Compositer* may sometimes have occasion to wet the *Page* in the *Galley*, and then (the *Galley* standing aslope upon the *Cafe*) the Water will soak between the sides of the Frame, and under Board, and quickly loosen it.

§. 6. Of the Correcting-stone.

The *Correcting-Stone* marked B in Plate 2. is made of *Marble*, *Purbeck*, or any other Stone that may be made flat and smooth: But yet the harder the Stone is the better; wherefore *Marble* is more preferable than *Purbeck*. First, Because it is a more compact Stone, having fewer and smaller Pores in it than *Purbeck*. And Secondly, because it is harder, and therefore less subject to be prick'd with the corners of a *Chase*, if through carelessness (as it sometimes happens) it be pitch'd on the Face of the Stone.

It is necessary to have it capacious, viz. large enough to hold two *Chases* and more, that the *Compositer* may sometimes for his convenience, set some *Pages* by on it ready to *Impose*, though two *Chases* lye on the *Stone*: Therefore a *Stone* of about Four Foot and an half long, and Two Foot broad is a convenient size for the generality of Work.

This *Stone* is to be laid upon a strong *Oaken-wood* Frame, made like the Frame of a common Table, so high, that the Face of the *Stone* may lye about three
Foot

Foot and an Inch above the Floor : And under the upper Rail of the Frame may be fitted a Row or two of Draw-Boxes, as at *a a a a a* and *b b b* on each of its longest Sides to hold *Flowers, Brads-Rules, Braces, Quotations, small Scabbords, &c.*

6. 7. Of Letter-Boards, and Paper-Boards.

Letter-Boards are Oblong Squares, about two Foot long, eighteen Inches broad, and an Inch and a quarter thick. They ought to be made of clean and well-season'd Stuff, and all of one piece: Their upper-side is to be Plained very flat and smooth, and their under-side is Clamped with pieces about two Inches square, and within about four Inches of either end, as well to keep them from Warping, as to bear them off the Ground or any other Flat they stand on, that the Fingers of the *Compositer* may come at the bottom of the Board to remove it whither he will: They are commonly made of *Fir*, though not so thick as I have mentioned, or all of one Piece: *Deal-Boards* of this breadth may serve to make them of; but *Joyners* commonly put *Master-Printers* off with ordinary *Deal-Boards*, which not being broad enough, they joyn two together; for which cause they frequently shrink, so as the joynt comes assunder, and the Board becomes usefess, unless it be to serve for a *Paper-Board* afterwards: For small and thin *Letters* will, when the Form is open, drop through, so as the *Compositer* cannot use the Board.

I us'd to make them of *Sugar-Chest*; That Stuff being commonly well-season'd, by the long lying of the
Sugar

Sugar in it, and is besides a fine hard *Wood*, and therefore less subject to be injured by the end of the *Shooting-Stick* when a *Form* is *Unlocking*.

Paper-Boards are made just like the *Letter-Boards*, though seldom so large, unless for great Work: Nor need such strict care be taken in making them so exactly smooth: their Office being only to set *Heaps* of *Paper* on, and to *Press* the *Paper* with.

§. 8. Of Furniture, Quoyns, Scabbord, &c.

By *Furniture* is meant the *Head-sticks*, *Foot-sticks*, *Side-sticks*, *Gutter-sticks*, *Riglets*, *Scabbords* and *Quoyns*.

Head sticks and all other *Furniture*, except *Scabbord*, are made of dry *Wainscot*, that they may not shrink when the *Form* stands by; They are *Quadrat* high; straight, and of an equal thickness all the length: They are made of several thicknesses for several Works, viz. from a *Brevier* which serves for some *Quarto's* to six or eight *Pica* thick, which is many times us'd to *Folio's*: And many of the *Head sticks* may also serve to make *Inner Side-sticks* of; for the *Master Printer* provides them of lengths long enough for the *Compositor* to cut to convenient *Seantlins* or *Lengths*, they being commonly about a *Yard* long when they come from the *Joiners*. And *Note*, that the *Head* and *Side sticks* are called *Riglets*, if they exceed not an *English* thick.

Outer Side-sticks and *Foot sticks* marked C in Plate 2. are of the same height of the *Head-sticks*, viz. *Quadrat* high, and are by the *Joiner* cut to the given length, and to the breadth of the particular *Pages* that

that are to be *Imposed*: The *Side-sticks* are placed against the outer side of the *Page*, and the *Foot-sticks* against the foot or bottom of the *Page*: The outer sides of these *Side* and *Foot-sticks* are bevil'd or sloped from the further to the hither end.

Gutter-sticks marked D in Plate 2. are as the former, *Quadrat* high, and are used to set between *Pages* on either side the *Crosses*, as in *Ottavo's*, *Twelves*, *Sixteens*, and *Forms* upwards; They are made of an equal thickness their whole length, like *Head-sticks*; but they have a Groove, or Gutter laid on the upper side of them, as well that the Water may drain away when the *Form* is Washed or Rinced, as that they should not *Print*, when through the tenderness of the *Tinpan*, the *Plattin* presses it and the *Paper* lower than ordinary.

Scabbord is that sort of *Scale* commonly sold by some *Iron-mongers* in Bundles; And of which, the *Scabbords* for *Swords* are made: The *Compositer* cuts it *Quadrat* high, and to his Length.

The *Master-Printer* is to provide both *Thick* and *Thin Scabbord*, that the *Compositer* may use either when different Bodied *Letter* happens in a *Page*, to justify the *Page* to a true length; And also that the *Pressman* may chuse *Thick* or *Thin* to make truer *Register*, as shall be shewed in proper place.

Quoyns are also *Quadrat* high, and have one of their sides Bevil'd away to comply with the Bevil of the *Side* and *Foot-sticks*; they are of different Lengths, and different Breadths: The great *Quoyns* about three Inches square, except the Bevil on one side as aforesaid; and these sizes diminish downwards.

to an Inch and an half in length, and half an Inch in breadth.

Of these *Quoyns* our *Master-Printer* provides several hundreds, and should provide them of at the least ten different Breadths between the aforesaid sizes; that the *Compositer* may chuse such as will best fit the *Chase* and *Furniture*.

The Office of these *Quoyns* are to *Lock* up the *Form*, viz. to wedge it up (by force of a *Mallet* and *Shooting-stick*) so close together, both on the sides and between Head and Foot of the *Page*, that every *Letter* bearing hard against every next *Letter*, the whole *Form* may *Rise*; as shall be shewed hereafter.

Their farther Office is to make *Register* at the *Press*.

§. 9. ¶. 1. Of the Mallet, Shooting-stick and Dressing-Block, Composing-sticks, Bodkin, and Chase. &c.

Printers Mallets have a *Cilindrick Head*, and a round Handle; The Head somewhat bigger, and the Handle somewhat longer than those *Joyners* commonly use; Yet neither shape or size different for any reason to be given: But only a Custom always used to have them so. The Head is continually made of *Beech*.

¶. 2. Of

¶ 2. *Of the Shooting-stick.*

The *Shooting-stick* must be made of *Box*, which Wood being very hard, and withal tough, will best and longest endure the knocking against the *Quoyns*. Its shape is a perfect Wedge about six Inches long, and its thicker end two Inches broad, and an Inch and an half thick; and its thin end about an Inch and an half broad, and half an Inch thick.

¶ 3. *Of the Dressing-Block.*

The *Dressing-Block* should be made of *Pear-tree*, Because it is a soft wood, and therefore less subject to injure the Face of the *Letter*; it is commonly about three Inches square, and an Inch high. Its Office is to run over the Face of the *Form*, and whilst it is thus running over, to be gently knockt upon with the Head of the *Shooting-stick*, that such *Letters* as may chance to stand up higher than the rest may be pressed down.

Our *Master-Printer* must also provide a pair of *Sheers*, such as *Taylors* use, for the cutting of *Brass-Rules*, *Scabbords*, &c.

A large *Sponge* or two, or more, he must also provide, one for the *Compositors* use, and for every *Press* one.

Pretty fine *Packthread* to tye up *Pages* with; But this is often chosen (or at least directed) by the *Compositor*, either finer or courser, according to the great or small *Letter* he works upon.

¶ 4. Of the Composing-stick.

Though every *Compositer* by Custom is to provide himself a *Composing-stick*, yet our *Master-Printer* ought to furnish his House with these Tools also, and such a number of them as is suitable to the size of his House; Because we will suppose our *Master-Printer* intends to keep some Apprentices, and they, unless by contract or courtesie, are not used to provide themselves *Composing-sticks*: And besides, when several *Compositers* work upon the same Book, their Measures are all set alike, and their *Titles* by reason of *Notes* or *Quotations* broader than their common Measure, So that a *Composing-stick* is kept on purpose for the *Titles*, which must therefore be common to all the *Compositers* that work upon that Work; And no one of them is obliged to provide a *Composing-stick* in common for them all: Therefore it becomes our *Master-Printers* task to provide them.

It is delineated in Plate 2. at E.

a The Head.

b b The Bottom.

c c The Back.

d The lower *Sliding-Measure*, or *Cheek*.

e The upper *Sliding-Measure*, or *Cheek*.

f f The Male-Screw.

g The Female-Screw.

These *Composing-sticks* are made of Iron Plate about the thickness of a thin *Scabbord*, and about ten Inches

Inches long doubled up square; so as the Bottom may be half an Inch and half a quarter broad; and the Back about an whole Inch broad. On the further end of this Iron Plate thus doubled up, as at *a* is Soldered on an Iron Head about a *Long-Primmer* thick; But hath all its outer edges Basild and Fil'd away into a Molding: This Iron Head must be so let into the Plate, and Soldered on to it, that it may stand truly square with the bottom, and also truly square with the Back, which may be known by applying the outer sides of a square to the Back and Bottom; as I shewed, *Numb. 3. Fol. 38, 39.* About two Inches from the Head, in the Bottom, is begun a row of round holes about an Inch assunder, to receive the shank of the *Male-Screw* that screws the *Sliding Measures* fast down to the Bottom; so that the *Sliding-Measures* may be set nearer or further from the Head, as the Measure of a *Page* may require.

The lower *Sliding-Measure* marked *d* is an Iron Plate a *thick Scabbord* thick, and of the Breadth of the inside of the Bottom; It is about four Inches long, and in its middle hath a Groove through it within half an Inch of the Fore-end, and three quarters of an Inch of the hinder end. This Groove is so wide all the way, that it may receive the Shank of the *Screw*. On the Fore-end of this Plate stands square upright another Iron Head about a *Brevier* thick, and reaches so high as the top of the Back.

The upper *Sliding-Measure* is made just like the lower, only it is about three quarters of an Inch shorter.

Between these two *Sliding-Measures*, *Marginal Notes* are *Composed* to any Width.

Compositors commonly examine the Truth of their *Stick* by applying the head of the *Sliding-Measure* to the inside of the Head of the *Stick*; and if they comply, they think they are square and true made: But this Rule only holds when the Head it self is square. But if it be not, 'tis easy to file the *Sliding-Measures* to comply with them: Therefore, as aforesaid, the square is the only way to examine them by.

¶ 5. Of the Bodkin.

The *Bodkin* is delineated in Plate 2. at *F* Its *Blade* is made of *Steel*, and well tempered, its shape is round, and stands about two Inches without the *Shank* of the *Handle*. The *Handle* is turned of soft wood as *Alder*, *Maple*, &c. that when *Compositors* knock the Head of the *Bodkin* upon the Face of a *Single Letter* when it stands too high, it may not batter the Face.

¶ 6. Of Chafes, marked G on the Correcting-Stone, Plate 2.

A *Chafe* is an Iron Frame about two and twenty Inches long, eighteen Inches broad, and half Inch half quarter thick; and the breadth of Iron on every side is three quarters of an Inch: But an whole Inch is much better, because stronger. All its sides must stand exactly square to each other; And when it is laid on the *Correcting-Stone* it must lye exactly flat,
viz.

viz. equally bearing on all its sides and Angles: The outside and inside must be Filed straight and smooth. It hath two *Crosses* belonging to it, *viz.* A *Short-Cross* marked *a a* and a *Long-Cross* marked *b b*: These two *Crosses* have on each end a Male Dustail Filed Bevil away from the under to the upper side of the *Cross*, so that the under side of the Dustail is narrower than the upper side of the Dustail. These Male Dustails are fitted into Female-Dustails, Filed in the inside of the *Chase*, which are also wider on the upper side of the *Chase* than on the under side; because the upper side of the *Cross* should not fall through the lower side. These *Crosses* are called the *Short* and the *Long Cross*.

The *Short-Cross* is Dustail'd in as aforesaid, just in the middle of the *Chase* as at *e e*, and the *Long-Cross* in the middle of the other sides the *Chase*, as at *d d*. The *Short-Cross* is also Dustail'd into Female-Dustails, made as aforesaid, about three Inches and an half from the middle; as at *e e*: So that the *Short Cross* may be put into either of the Female-Dustails as occasion serves. The middle of these two *Crosses* are Filed or notched half way through, one on its upper, the other on its under side to let into one another, *viz.* the *Short-Cross* is Filed from the upper towards the under side half way, and the *Long-Cross* is Filed from the lower towards the upper-side half way: The *Crosses* are also thus let into each other, where they meet at *f*, when the *Short-Cross* is laid into the other Female-Dustails fitted to it at *e e*.

In the middle, between the two edges of the upper side of the *Short-Cross*, is made two Grooves parallel

rallel to the sides of the *Cross*, beginning at about two Inches from each end; and ending at about seven Inches from each end: It is made about half an Inch deep all the way, and about a quarter of an Inch broad, that the *Points* may fall into them. The *Short-Cross* is about three quarters of an Inch thick, and the *Long Cross* about half that thickness. All their sides must be Fil'd straight and smooth, and they must be all the way of an equal thickness.

Hitherto our *Master-Printer* hath provided Materials and Implements only for the *Compositers* use; But he must provide Machines and Tools for the *Press-men* to use too: which (because I am loath to discourage my Customers with a swelling price at the first reviving of these Papers) I shall (though against my interest) leave for the subject of the next succeeding *Exercises*.

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Printing.**The Second VOLUME.**

§. 10. Of the Presses.

THere are two sorts of *Presses* in use, viz. the old fashion and the new fashion; The old fashion is generally used here in *England*; but I think for no other reason, than because many *Press-men* have scarce Reason enough to distinguish between an excellently improved Invention, and a make-shift slovenly contrivance, practiced in the minority of this Art.

The New-fashion'd *Presses* are used generally throughout all the *Low-Countries*; yet because the

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Old-fashion'd *Presses* are used here in *England* (and for no other Reason) I have in Plate 3. given you a delineation of them; But though I give you a draught of them; yet the dimensions of every particular Member I shall omit, referring those that think it worth their while, to the *Joyners* and *Smiths* that work to *Printers*: But I shall give a full description of the New-fashion'd *Press*, because it is not well known here in *England*; and if possible, I would for Publick benefit introduce it.

But before I proceed, I think it not amiss to let you know who was the Inventer of this New-fashion'd *Press*, accounting my self so much oblig'd to his Ingeniery for the curiosity of this contrivance, that should I pass by this opportunity without naming him, I should be injurious to his Memory.

It was *Willem Jansen Blaeu* of *Amsterdam*: a Man as well famous for good and great *Printing*, as for his many *Astronomical* and *Geographical* exhibitions to the World. In his Youth he was bred up to *Joyner*y, and having learn'd his Trade, betook himself (according to the mode of *Holland*) to Travel, and his fortune leading him to *Denmark*, when the noble *Tycho Brahe* was about setting up his *Astronomical Observatory*, was entertain'd into his service for the making his Mathematical-Instruments to Observe withal; in which Instrument-making he shew'd himself so intelligent and curious; that according to the general report of many of his personal acquaintance, all or most of the *Syderal Observations* set forth in *Tycho's* name, he was intrusted to make, as well as the Instruments.

And

And before these Observations were publish'd to the World, *Tycho*, to gratify *Blaew*, gave him the Copies of them, with which he came away to *Amsterdam*, and betook himself to the making of *Globes*, according to those Observations. But as his Trade increased, he found it necessary to deal in *Geographical Maps* and *Books* also, and grew so curious in *Engraving*, that many of his best *Globes* and *Maps* were *Engraved* by his own Hands; and by his conversation in *Printing* of Books at other *Printing-houses*, got such in-sight in this Art, that he set up a *Printing-house* of his own. And now finding inconveniencies in the obsolete Invention of the *Press*, He contrived a remedy to every inconvenience, and fabricated nine of these New-fashioned *Presses*, set them all on a row in his *Printing-house*, and call'd each *Press* by the name of one of the *Muses*.

This short History of this excellent Man is, I confess foreign to my Title; But I hope my Reader will excuse the digression, considering it tends only to the commemoration of a Person that hath deserved well of Posterity, and whose worth without this small Monument, might else perhaps have slid into Oblivion.

The *Press* is a Machine consisting of many Members; it is delineated in Plate 4.

a a The Feet.

b b The Cheeks.

c The Cap.

d The Winter.

e The Head.

f The Till.

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g g The

g g The *Hofe*. In the Cross-Iron of which, encompassing the *Spindle*, is the *Garter*.

h h h h The *Hooks* on the *Hofe* the *Plattin* hangs on.

i k l m n The *Spindle*.

i Part of the *Worm* below the *Head*, whose upper part lies in the *Nut* in the *Head*.

k l The *Eye* of the *Spindle*.

m The *Shank* of the *Spindle*.

n The *Toe* of the *Spindle*.

o o o o The *Plattin* tyed on the *Hooks* of the *Hofe*.

p The *Bar*.

q The *Handle* of the *Bar*.

r r The *Hind-Posts*.

s s The *Hind-Rails*.

t t The *Wedges* of the *Till*.

u u The *Mortesses* of the *Cheeks*, in which the *Tenants* of the *Head* plays.

x x x x y y The *Carriage*.

x x x x The outer *Frame* of the *Carriage*.

y y The *Wooden-Ribs* on which the *Iron-Ribs* are fastned.

z The *Stay* of the *Carriage*, or the *Stay*.

1. The *Coffin*.

2. The *Gutter*.

3. The *Planck*.

4. The *Gallows*.

5. The *Tinpan*.

6. The *Frisket*.

7. The *Points*.

8. The *Point-Screws*.

All these several Members, by their Matter, Form and Position, do particularly contribute such an assistance

stance to the whole Machine, that it becomes an Engine managable and proper for its intended purpose.

But because the smallness of this altogether-Draft may obscure the plain appearance of many of these Parts; Therefore I shall give you a more particular description, and large delineation of every Member in the *Press*: And first of the Wooden work: Where, *Note*, that all the Fram'd Wooden-work of a *Press* is made of Good, Fine, Clean, Well-season'd Oak.

¶ 1. Of the Feet.

The *Feet* (marked *a a* in Plate 5.) are two Foot nine Inches and an half long, five Inches deep; and six Inches broad, and have their out-sides Tryed to a true square, as was taught, *Numb. 5. §. 15*. It hath (for ornament sake) its two ends bevil'd away in a Molding, from its upper-side to its lower, about four Inches within the ends; about four Inches and three quarters within each end of each Foot is made in the middle of the Breadth of the upper-side of the Foot a Mortise two Inches wide, to receive the *Tennants* of the lower-end of the *Cheek*, and the *Tenant* of the lower end of the *Hind-Post*: The Mortise for the *Cheek* is eight Inches long, *viz.* the Breadth of the *Cheek*: And the Mortise for the *Hind-Post* is four Inches long, *viz.* the square of the *Hind-Post*.

¶ 2. Of the Cheeks.

The *Cheeks* (marked *b b* in Plate 5) are five Foot and ten Inches long (besides the *Tennants* of the top

and bottom) eight Inches broad; and four Inches and an half thick. All its Sides are tryed square to one another. It hath a *Tennant* at either end, its lower *Tennant* marked *a* to enter the Fore-end of the Foot, runs through the middle of the Breadth of the *Cheek*, which therefore is made to fit the Mortels in the Foot, and is about four Inches long, and therefore reaches within an Inch of the bottom of the Foot; But the *Tennant* at the upper end of the *Cheek* marked *a*, is cut a-thwart the breadth of the *Cheek*, and therefore can have but four Inches and an half of Breadth, and its thickness is two Inches. Its length is four Inches; so that it reaches into the Mortels in the Cap, within half an Inch of the Top.

In the lower-end *Tennant* is two holes bored, within an Inch and an half of either side, and within an Inch and an half of the Sholder, with a three quarter Inch *Augure*, to be pin'd into the Feet with an Iron Pin.

In the middle of the upper *Tennant*, and within an Inch and an half of the Sholder, is bored another hole, to Pin the *Tennant* into the Cap, also with an Iron Pin.

Between *b c* two Foot and half an Inch, and three Foot seven Inches of the Bottom Sholder of the *Tennant*, viz. from the top of the *Winter* to the under Sholder the *Till* rests upon, is cut flat away into the thickness of the *Cheek*, three Inches in the Inside of the *Cheek*; so that in that place the *Cheek* remains but an Inch and an half thick: And the *Cheeks* are thus widened in this place, as well because the Dustail *Tennants* of the *Winter* may go in between them, as al-

so that the *Carriage* and *Coffin* may be made the wider.

Even with the lower Sholder of this flat cutting-in, is made a *Duftail Mortels* as at *d*, to reach eight Inches and an half, viz. the depth of the *Winter* below the said Sholder. This Mortels is three Inches wide on the inside the *Cheek*, and three Inches deep; But towards the inside the *Cheek*, the Mortels widens in a straight line from the said three Inches to five Inches, and so becomes a *Duftail Mortels*. Into this *Duftail Mortels* is fitted a *Duftail Tennant*, made at each end of the *Winter*.

Two Inches above the aforesaid Cutting-in, is another cutting-in of the same depth, from the Inside the *Cheek* as at *e*. This cutting-in is but one Inch broad at the farther side the *Cheek*, and an Inch and a quarter on the hither side the *Cheek*. The under side of this Cutting-in, is straight through the *Cheek*, viz. Square to the sides of the *Cheek*: But the upper side of this Cutting-in, is not square through the *Cheeks*, But (as aforesaid) is one quarter of an Inch higher on the fore-side the *Cheek* than it is on the further side; So that a Wedge of an Inch at one end, and an Inch and a quarter at the other end may fill this Cutting-in.

At an Inch within either side the *Cheek*, and an Inch below this Cutting-in, as at *f f*, is made a small Mortels an Inch and an half wide, to which two *Tennants* must be fitted at the ends of the *Till*, so that the *Tennants* of the *Till* being slid in through the Cutting-in aforesaid, may fall into these Mortesses; and a Wedge being made fit to the Cutting-in, may press upon the *Tennants* of the *Till*, and force it down to keep it steddy in its place. Here

Here we see remains a square Sholder or substance of Wood between two Cuttings-in ; But the under corner of this square Sholder is for Ornament-sake Bevil'd away and wrought into an *Ogee*.

At two Inches above the last Cutting-in, is another Cutting-in, but this Cutting-in goes not quite through the breadth of the *Cheek*, but stops at an Inch and an half within the further side the *Cheek* ; So that above the *Till* and its *Wedge* is another Sholder or substance of Wood, whose upper Corner is also Bevil'd away, and wrought to a Molding as the former.

The last Cutting-in is marked *g*, and is eight Inches and a quarter above the Sholder of the *Till*, that it may easily contain the depth of the *Head* ; The substance remaining is marked *h*. This Cutting-in is made as deep into the thickness of the *Cheek* as the former Cuttings-in are, *viz.* three Inches ; and the reason the *Cheek* is cut-in here, is, that the *Cheeks* may be wide enough in this place to receive the *Head*, and its *Tennants*, without un-doing the *Cap* and *Winter*.

Just above this Cutting-in is made a square Mortels in the middle of the *Cheek*, as at *i*, it is eight Inches long, and two Inches and an half wide, for the *Tennant* of the *Head* to play in.

Upon the fore-side of the *Cheek* is (for Ornament sake) laid a Molding through the whole length of the *Cheek* (a square at the Top and Bottom an Inch deep excepted) it is laid on the outer side, and therefore can be but an Inch broad ; Because the Cuttings-in on the inside leaves the substance of Stuff but an

Inch and an half thick, and should the Moldings be made broader, it would be interrupted in the several Cuttings in, or else a square of a quarter of an Inch on either side the Molding could not be allowed, which would be ungraceful.

¶ 3. *Of the Cap marked c in Plate 5.*

The *Cap* is three Foot and one Inch long, four Inches and an half deep, and nine Inches and an half broad; But its fore-side is cut away underneath to eight Inches, *Viz.* the breadth of the *Cheeks*. Three quarters of an Inch above the bottom of the *Cap*, is a small *Facia*, which stands even with the thickness of the *Cheeks*; Half an Inch above that a Bead-Molding, projecting half an Inch over the *Facia*. Two Inches above that a broad *Facia*, also even with the thickness of the *Cheeks*; and an Inch and a quarter above that is the upper Molding made projecting an Inch and an half over the two *Facia*'s aforesaid, and the thickness of the *Cheeks*.

Each end of the *Cap* projects three Inches quarter and half quarter over the *Cheeks*, partly for Ornament, but more especially that substance may be left on either end beyond the Mortesses in the *Cap*; and these two ends have the same Molding laid on them that the fore-side of the *Cap* hath.

Within two Inches and half quarter of either end, on the under-side the *Cap* is made a square Mortess two Inches wide, and four Inches and an half long, *viz.* the thickness of the *Cheek* inwards, as at *aa*, to receive the Top Tennants of the *Cheeks*; which Top

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Tennants

Tennants are with an Iron Pin (made tapering of about three quarters of an Inch thick) pin'd into the Mortels of the *Cap*, to keep the *Cheeks* stiddy in their position.

¶ 4. Of the *Winter* marked d in Plate 5.

The Length of the *Winter* besides the *Tennants*, is one Foot nine Inches and one quarter of an Inch ; The Breadth of the *Winter* eight Inches, viz. the Breadth of the *Cheek*, and its depth nine Inches ; all its sides are tryed square ; But its two ends hath each a *Duftail-Tenant* made through the whole depth of the *Winter*, to fit and fall into the *Duftail Mortefes* made in the *Cheeks* : These *Duftail-Tennants* are intended to do the Office of a *Summer*, Because the spreading of the ends of these two *Tennants* into the spreading of the *Mortefes* in the *Cheeks*, keeps the two *Cheeks* in a due distance, and hinders them from flying assunder.

But yet I think it very convenient to have a *Summer* also, the more firmly and surer to keep the *Cheeks* together ; This *Summer* is only a Rail *Tennanted*, and let into *Mortefes* made in the inside of the *Cheeks*, and Screwed to them as the Rails described, Numb. 15. ¶ 4. are Screwed into the Stiles of the *Cafe-Frame* ; Its depth four Inches and an half, and its breadth eight Inches, viz. the breadth of the *Cheeks*.

¶ 5. Of

¶ 5. Of the Head marked c in Plate 5.

The length of the *Head* besides the *Tenant* at either end, is one Foot nine Inches and one quarter of an Inch ; The breadth eight Inches and an half, and its depth eight Inches. The Top, Bottom and Hind-sides are tryed Square, but the foreside projects half an Inch over the Range of the fore-sides of the *Cheeks*; in which Projecture is cut a Table with a hollow Molding about it, two Inches distant from all the sides of the fore-side of the *Head* : Its *Tenants* are three Inches Broad, and are cut down at either end, from the top to the bottom of the *Head*, and made fit to the Mortesses in the *Cheeks*, that they may slide tight, and yet play in them.

In the under-side of the *Head* is cut a square Hole, (as at *a*,) about four Inches square; and three Inches and an half deep, into which the *Brass-Nut* is to be fitted: And to keep this *Nut* in its place (lest the weight of it should make it fall out) is made on either side the square hole, at about half an Inch distance from it, (as at *bb*) a square Hole quite through the Top and Bottom of the *Head* about three quarters of an Inch wide ; and into this square Hole is fitted a square piece of Iron to reach quite through the *Head*, having at its under-end a Hook turned square to clapse upon the under-side of the *Nut* ; and on its upper-end a Male-Screw reaching about an Inch above the upper-side of the *Head*, which by the help of a Female-screw made in an Iron *Nut*, with Ears to it to turn it about draws the *Clasp* at the bottom of the Iron *Shank*.

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close against the *Nut*, and so keeps it from falling out.

In the middle of the wide square Hole that the *Nut* is let into, is bored a round Hole through the top of the *Head*, of about three quarters of an Inch wide, for the *Press-man* to pour *Oyl* in at so oft as the *Nut* and *Spindle* shall want *Oyling*.

At three Inches from either end of the *Head* (as at cc) is bored a Hole quite through the top and bottom of the *Head*, which holes have their under ends squar'd about two Inches upwards, and these squares are made so wide as to receive a square Bar of Iron three quarters of an Inch square; But the other part of these Holes remain round: Into these Holes two Irons are fitted called the *Screws*.

The Shanks of these *Screws* are made so long as to reach through the *Head* and through the *Cap*: At the upper-end of these Shanks is made Male-screws, and to these Male-screws, Iron Female-screws are fitted with two Ears to twist them the easier about.

So much of these Iron Shanks as are to lye in the square Hole of the *Head* afore said, are also squared to fit those square Holes, that when they are fitted and put into the Holes in the *Head*; they may not twist about.

To the lower-ends of these Iron-Shanks are made two Square, Flat Heads, which are let into and buried in the under-side of the *Head*; And upon the Sholders of those two Flat Heads, rests the weight of the *Head* of the *Press*; And by the *Screws* at the Upper-end of the Shanks are hung upon the upper-side of the *Cap*, and Screwed up or let down as occasion requires.

¶ 6. *Of the Till, marked f in Plate 5.*

The *Till* is a Board about one Inch thick, and is as the *Head* and *Winter*, one Foot nine Inches and a quarter long, besides the *Tennants* at either end; Its Breadth is the Breadth of the *Cheeks*, viz. eight Inches; It hath two *Tennants* at either end as at *a a a a*, each of them about an Inch and an half long, and an Inch and an half broad, and are made at an Inch distance from the fore and Back-side, so that a space of two Inches is contained in the middle of the ends between the two *Tennants*; these *Tennants* are to be laid in the Mortesses in the *Cheeks* delineated at *f f* in Plate 5. and described in this §. 10. ¶. 2.

In its middle it hath a round Hole about two Inches and an half wide, as at *b*, for the Shank of the *Spindle* to pass through.

At seven Inches and a quarter from either end, and in the middle between the Fore and Back-side, is made two square Holes through the *Till*, as at *c c*, for the Iron *Hose* to pass through.

¶ 7. *Of the Hind-Posts marked a a in Plate 6.*

At one Foot distance from the Hind-sides of the *Cheeks* are placed upright to *Hind-Posts*, they are three Foot and four Inches long besides the *Tennants*, which *Tennants* are to be placed in the Mortesses in the hinder ends of the *Feet*; Their thickness is four Inches on every side, and every side is tryed square;

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But

But within eight Inches of the top is turned a round Ball with a Button on it, and a Neck under it, and under that Neck a straight Plinth or Base: This turn'd work on the top is only for Ornament sake.

There are six *Rails* fitted into these *Hind-Posts*, two behind marked *a b*, one of them standing with its upper side at two Inches below the turned Work, the other having its upper-side lying level with the upper-side of the *Winter*.

These two *Rails* are each of them *Tennanted* at either end, and are made so long, that the out-sides of the *Hind-Posts* may stand Range or even with the outer-sides of the *Cheeks*; These *Tennants* at either end are let into Mortesses made in the in-sides of the *Hind-Posts*, and Pin'd up with half Inch wooden Pins, Glewed in, as was shewn Vol. 1. Numb. 5. §. 17. Because the two *Hind-Posts* need not be separated for any alteration of the *Press*.

The two *Side-Rails* on either side the *Press* are *Tennanted* at each end, and let into Mortesses made in the *Cheeks* and *Hind-Posts*, so as they may stand Range with the outer-sides of the *Cheeks* and *Hind-Posts*; But the *Tennants* that enter the Mortesses in the *Cheeks* are not pin'd in with Wooden Pins, and Glewed, because they may be taken assunder if need be; But are Pin'd in with Iron Pins, made a little tapering towards the entring end, so as they may be driven back when occasion serves to alter the *Press*: And the *Tennants* that enter the Mortesses in the *Hind-Posts* are fastned in by a Female-screw, let in near the end of the *Rail*, which receives a Male-screw thrust through the *Hind-Posts*, even as I shew'd in

§. 4. the *Fore* and *Back-Rails* of the *Cafe-Frames* was.

¶ 8. Of the *Ribs* marked b in Plate 6.

The *Ribs* lye within a Frame of four Foot five Inches long, one Foot eleven Inches broad; its two *End-Rails* one Inch and an half thick, its *Side-Rails* two Inches and an half thick; and the breadth of the *Side* and *End-Rails* two Inches and an half. But the *Side-Rails* are cut away in the in-side an Inch and an half towards the outer sides of the *Rails*, and an Inch deep towards the Bottom sides of the *Rails*, so that a square *Cheek* on either *Side-Rail* remains. This cutting down of the *Outer-Rails* of the *Frame* is made, because the Planck of the *Carriage* being but one Foot eight Inches an an half broad, may easily slide, and yet be gaged between these *Cheeks* of the *Rail*, that the *Cramp-Irons* Nailed under the *Carriage Planck* joggle not on either side off the *Ribs*, as shall more fully be shewn in the next §.

Between the two *Side-Rails* are framed into the two *End-Rails* the two *Wooden-Ribs* two Inches and an half broad; and an Inch and an half thick; they are placed each at an equal distance from each *Side-Rail*, and also at the same distance between themselves. Upon these two *Ribs* are fast Nailed down the *Iron-Ribs*, of which more shall be said when I come to speak of the *Iron-work*.

¶ 9. Of the Carriage, Coffin and its Planck,
marked a in Plate 7.

The *Planck* of the *Carriage* is an Elm-Planck an Inch and an half thick, four Foot long, and one Foot eight Inches and three quarters broad; upon this *Planck* at its fore-end is firmly Nailed down a square Frame two Foot four Inches long, one Foot ten Inches broad, and the thickness of its Sides two Inches and an half square: This Frame is called the *Coffin*, and in it the *Stone* is *Bedded*.

Upon each of the four Corners of this *Coffin* is let in and fastned down a square Iron Plate as at *a a a a*; with Return Sides about six Inches long each side, half a quarter of an Inch thick, and two Inches and a quarter broad; upon the upper outer-sides of each of these Plates is fastned down to them with two or three Rivets through each side, another strong Iron half an Inch deep, and whose outer Angles only are square, but the Inner Angles are obtuse, as being sloped away from the Inner-Angle towards the farther-end of each inner-side, so as the *Quoins* may do the Office of a Wedge between each inner-side and the *Chase*.

The Plates of these Corners (as I said) are let in on the outer-Angles of the upper-side of the Frame of the *Coffin*, so as the upper-sides of the Plates lye even with it, and are Nailed down, or indeed rather Rivetted down through the bottom and top-sides of the Frame of the *Coffin*, because then the upper-sides of the Holes in the Iron Plates being square Bored

Bored (that is, made wider on the upper side of the Plate, as I shall shew when I come to the making of *Mathematical Instruments*) the ends of the Shanks of the Iron Pins may be so battered into the Square-boring, that the whole Superficies of the Plate when thus Rivetted shall be smooth, which else with the exturberancies of Nail-heads would hinder the free sliding of the *Quoins*.

At the hinder end of the Frame of the *Coffin* are fastned either with strong Nails, Rivets, or rather Screws, two Iron *Half-Joynts*, as at *b b*, which having an Iron Pin of almost half an Inch over put through them; and two *Match half-Joynts* fastned on the Frame of the *Tympan*, these two *Match half-Joynts* moving upon the Iron Pin aforesaid, as on an *Axis*, keeps the *Tympan* so truly gaged, that it always falls down upon the *Form* in the place, and so keeps *Register* good, as shall further be shewed in proper place.

Behind the *Coffin* is Nailed on to its outside, a *Quarter*, as at *c c* this *Quarter* is about three Inches longer than the breadth of the *Coffin*, it hath all its sides two Inches over, and three of them square; but its upper side is hollowed round to a Groove or Gutter an Inch and an half over. This Gutter is so Nailed on, that its hither end standing about an Inch higher than its further end, the Water that descends from the *Tympan* falling into it is carried away on the farther side the *Coffin* by the declivity of the farther end of the Gutter, and so keeps the Planck of the *Carriage* neat and cleanly, and preserves it from rotting.

Parallel to the outer sides of the hind part of the Planck of the *Carriage*, at three Inches distance from either side, is Nailed down on the upper side of the Planck two Female-Duftail Grooves, into which is fitted (so as they may slide) two Male-Duftails made on the two Feet of the *Gallows* (as at *dd*) that the *Tinpan* rests upon; and by the sliding forward or backward of these Duftail Feet, the height of the *Tinpan* is raised or depressed according to the Reason or Fancy of the *Press-man*.

At three Inches from the hinder Rail of the *Coffin*, in the middle, between both sides of the Planck, is cut an Hole four Inches square (as at *ee*) and upon the hither and farther side of this Hole is fastened down on each side a *Stud* made of Wood (as at *ff*) and in the middle of these two *Studs* is made a round Hole about half an Inch over, to receive the two round ends of an Iron Pin; which Iron Pin, though its ends be round, is through the middle of the Shank square, and upon that square is fitted a round *Wooden-Rowler* or *Barrel*, with a Shoulder on either side it, to contain so much of the *Girt* as shall be rowled upon it; And to one end of the *Rowler* is fastened an Iron *Circle* or *Wheel*, having on its edge *Teeth* cut to stop against a *Clicker*, when the *Rowler* with an Iron Pin is turned about to strain the *Girt*.

¶ 10. Of the *Tympan* and Inner-*Tympan*, marked *b* in Plate 7.

The *Tympan* is a square Frame, three sides whereof are Wood, and the fourth Iron. Its width is one Foot

Foot eight Inches, its length two Foot two Inches; the breadth of the wooden Sides an Inch and an half, and the depth one Inch.

On its short Wooden-side, viz. its Hind-end, at the two Corners is Rivetted an Iron *Match-Joynt*, to be pinned on to another *Half joynt* fastned on the *Hind-Rail* of the *Coffin*.

The other end, viz. the Fore-end of the *Tympan* is made of Iron; with a square *Socket* at either end for the Wooden ends of the *Tympan* to fit and fasten into. This Iron is somewhat thinner and narrower than an ordinary Window-Casement.

Upon the outer edge of this Iron, about an Inch and an half off the ends of it, is made two Iron *Half-joynts* to contain a Pin of about a quarter of an Inch over, which Pin entring this *half-joynt*, and a *match Half-joynt* made upon the *Frisket*, serves for the *Frisket* to move truly upon.

In the middle of each long *Rail* of the *Tympan*, is made through the top and bottom an Hole half an Inch square, for the square Shanks of the *Point-Screws* to fit into.

The like Holes are also made in the *Tympan*, at one third part of its length from the Fore-end or *Frisket-joynt*, to place the *Point-Screws* in; when a *Twelves*, *Eighteens*, &c. is wrought.

Into the Inner-side of this *Tympan* is fitted the *Inner-Tympan*, whose three sides are also made of Wood, and its fourth side of Iron, as the *Tympan*, but without *joynts*; it is made so much shorter than the *Outer-Tympan*, that the outer edge of the Iron of the *Inner-Tympan* may lye within the inner edge of the Iron on the *Outer-Tym-*

pan ; and it is made so much narrower than the inside of the *Tympan*, that a convenient room may be allowed to paste a *Vellom* between the inside of the *Tympan*, and the outside of the *Inner-Tympan*.

About the middle, through the hither-side of the *Inner-Tympan*, is let in and fastned an Iron Pin about a quarter of an Inch over, and stands out three quarters of an Inch upon the hither out-side of the *Inner-Tympan*, which three quarters of an Inch Pin fits into a round hole made in the inner-side of the *Tympan*, to gage and fit the *Inner-Tympan* right into the *Tympan*; for then by the help of an Iron turning *Clasp* on the further side the *Tympan*, the *Inner-Tympan* is kept firmly down and in its position.

¶ 11. *Of the Inck-Block, Slice, Brayer, and Catch of the Bar, marked c d e f in Plate 7.*

To the *Rail* between the hither *Cheek* and *Hind-Post* is fastned the *Inck-Block*, which is a Beechen-board about thirteen Inches long, nine Inches broad, and commonly about two Inches thick, and hath the left hand outer corner of it cut away; it is *Railed* in on its farther and hinder-sides, and a little above half the hither-side, with *Wainscot-Board* about three quarters of an Inch thick, and two Inches and an half above the upper-side the board of the *Inck-Block*. It is described in Plate 7. at c.

The *Brayer* marked *a* is made of *Beech*. It is turned round on the sides, and flat on the bottom, its length is

is about three Inches, and its diameter about two Inches and an half; it hath an Handle to it about four Inches long. Its Office is to rub and mingle the *Inck* on the *Inck-Block* well together.

The *Slice* is a little thin Iron *Shovel* about three or four Inches broad, and five Inches long; it hath an Handle to it of about seven Inches long. Near the *Shovel* through the Handle is fitted a small Iron of about two Inches long standing Perpendicular to both the sides of the Handle, and is about the thickness of a small Curtain-Rod. It is described at e.

The *Catch* of the *Bar* described at f is a piece of Wood two Inches thick, four Inches broad, and ten Inches long; The top of it is a little Bevil'd or Slopd off, that the *Bar* may by its *Spring* fly up the Bevil till it stick. This Bevil projects three Inches over its straight Shank, which reaches down to the Bottom; in the middle of this Shank, through the fore and back side, is a Mortise made from within an Inch of the Rounding to an Inch and an half of the Bottom. This Mortise is three quarters of an Inch wide, and hath an Iron Pin with a Shoulder at one end fitted to it, so as it may slide from one end of the Mortise to the other. At the other end of the Iron Pin is made a Male-Screw which enters into a Female Iron Screw let into the further *Cheek* of the *Press*; so that the *Catch* may be Screwed close to the *Cheek*, as shall further be spoken to hereafter.

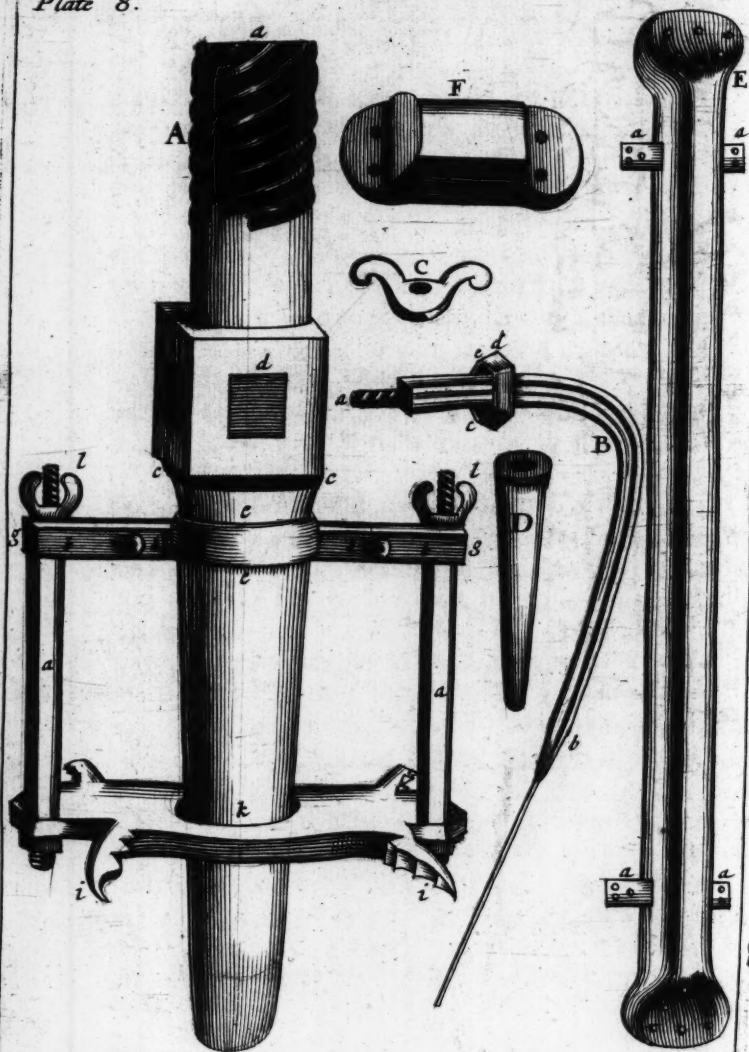
¶ 12. Of the Iron-work, and first of the Spindle marked A in Plate 8.

From the Top to the Toe of the Spindle, viz. from *a* to *b* is sixteen Inches and a half, the length of the Cilinder the Worms are cut upon is three Inches and a quarter, and the diameter of that Cilinder two Inches and a quarter; between the bottom of the Worms and top of the Cube one Inch and an half; the Cube marked *c c c c* is two Inches and three quarters; the square Eye at *d* in the middle of the Cube is an Inch and a quarter through all the sides of the Cube, one Inch under the Cube at *e* is the Neck of the Spindle, whose diameter is two Inches. It is one Inch between the two shoulders, viz. the upper and under shoulders of the Neck at *e e* so that the Cilinder of the Neck is one Inch long; the very bottom of the Spindle at *h* is called the Toe, it is made of an Hemispherical form, and about one Inch in diameter; This Toe should be made of Steel, and well Tempered, that by long or careless usage, the point of pressure wear not towards one side of the Toe, but may remain in the Axis of the Spindle.

§. II. Of

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Plate 8.



§. 11. Of the Worms of the Spindle.

I promised at the latter end of *Numb. 2.* to give a more copious account than there I did of making *Worms*, when I came to exercise upon *Printing-Press Spindles*; and being now arrived to it, I shall here make good my promise.

¶ 1. The *Worms* for *Printing-Press Spindles* must be projected with such a declivity, as that they may come down at an assigned progress of the *Bar*.

The assigned progress may be various, and yet the *Spindle* do its office: For if the *Cheeks* of the *Press* stand wide assunder, the sweep or progress of the same *Bar* will be greater than if they stand nearer together.

It is confirm'd upon good consideration and Reason as well as constant experience, that in a whole Revolution of the *Spindle*, in the *Nut*, the *Toe* does and ought to come down two Inches and an half; but the *Spindle* in work seldom makes above one quarter of a Revolution at one *Pull*, in which sweep it comes down but half an Inch and half a quarter of an Inch; and the reason to be given for this coming down, is the squeezing of the several parts in the *Press*, subject to squeeze between the Mortesses of the *Winter* and the Mortesses the *Head* works in; and every Joynt between these are subject to squeeze by the force of a *Pull*. As first, The *Winter* may squeeze down into its Mortels one third part of the thickness of a *Scabbord*. (Allowing a *Scabbord* to be half a *Nomparel* thick.) Secondly, The *Ribs* squeeze closer to
 K the

the *Winter* one *Scabbord*. Thirdly, The *Iron-Ribs* to the *Wooden Ribs* one *Scabbord*. Fourthly, The *Cram-Irons* to the *Planck* of the *Coffin* one *Scabbord*. Fifthly, The *Planck* it self half a *Scabbord*. Sixthly, The *Stone* to the *Planck* one *Scabbord*. Seventhly, The *Form* to the *Stone* half a *Scabbord*. Eighthly, The *Justifiers* in the *Mortels* of the *Head* three *Scabbords*. Ninthly, The *Nut* in the *Head* one *Scabbord*. Tenthly, The *Paper*, *Tympans* and *Blankets* two *Scabbords*. Eleventhly, Play for the *Irons* of the *Tympans* four *Scabbords*. Altogether make fifteen *Scabbords* and one third part of a *Scabbord* thick, which (as aforesaid) by allowing two *Scabbords* to make a *Nomparel*, and as I shewed in *Vol. 2. Numb. 2. §. 2.* One hundred and fifty *Nomparels* to make one *Foot*, gives twelve and an half *Nomparels* for an *Inch*; and consequently twenty five *Scabbords* for an *Inch*; so by proportion, fifteen *Scabbords* and one third part of a *Scabbord*, gives five eighth parts of an *Inch*, and a very small matter more, which is just so much as the *Toe* of the *Spindle* comes down in a quarter of a Revolution.

This is the Reason, that the coming down of the *Toe* ought to be just thus much; for should it be less, the natural Spring that all these Joynts have, when they are unsqueez'd, would mount the *Irons* of the *Tympans* so high, that it would be troublesom and tedious for the *Press-man* to Run them under the *Plat-tin*, unless the *Cheeks* stood wider assunder, and consequently every sweep of the *Bar* in a *Pull* exceed a quarter of a Revolution, which would be both laborious for the *Press-man*, and would hinder his usual riddance of Work.

I shew'd

I shew'd in *Numb. 2. fol. 31, 32, 33, 34, 35.* the manner of making a Screw in general; but assigned it no particular Rule; which for the aforefaid reason, these *Printing-Prefs Screws* are strictly bound to have: Therefore its assigned Rise being two Inches and an half in a Revolution, This measure must be set off upon the Cilindrick Shank, from the top towards the Cube of the *Spindle*, on any part of the *Cilinder*, and there make a small mark with a fine *Prick-Punch*, and in an exact Perpendicular to this mark make another small mark on the top of the *Cilinder*, and laying a straight *Ruler* on these two marks, draw a straight line through them, and continue that line almost as low as the Cube of the *Spindle*. Then divide that portion of the straight line contained between the two marks into eight equal parts, and set off those equal parts from the two Inch and half mark upwards, and then downwards in the line so oft as you can: Divide also the Circumference of the Shank of the *Cilinder* into eight equal parts, and draw straight lines through each division, parallel to the first upright line; and describe the *Screw* as you were directed in the afore-quoted place; so will you find that the revolution of every line so carried on about the Shank of the *Cilinder*, will be just two Inches and an half off the top of the Shank: which measure and manner of working may be continued downward to within an Inch and an half of the Cube of the *Spindle*. This is the Rule and Measure that ought to be observ'd for ordinary *Presses*: But if for some by-reasons the aforefaid Measure of two Inches and an half must be varied, then the varied Measure

must be set off from the top of the Cilinder, and working with that varied Measure as hath been directed, the *Toe* of the *Spindle* will come down lower in a revolution if the varied Measure be longer, or not so low if the varied Measure be shorter.

There is a Notion vulgarly accepted among Workmen, that the *Spindle* will Rise more or less for the number of *Worms* winding about the Cilinder; for they think, or at least by tradition are taught to say, that a *Three-Worm'd Spindle* comes faster and lower down than a *four-Worm'd Spindle*; But the opinion is false; for if a *Spindle* were made but with a *Single-Worm*, and should have this Measure, viz. Two Inches and an half set off from the top, and a *Worm* cut to make a Revolution to this Measure, it would come down just as fast, and as low, as if there were two, three, four, five or six *Worms*, &c. cut in the same Measure: For indeed, the numbers of *Worms* are only made to preserve the *Worms* of the *Spindle* and *Nut* from wearing each other out the faster; for if the whole stress of a *Pull* should bear against the Sholder of a single *Worm*, it would wear and shake in the *Nut* sooner by half than if the stress should be borne by the Sholders of two *Worms*; and so proportionably for three, four, five *Worms*, &c.

But the reason why four *Worms* are generally made upon the *Spindle*, is because the Diameters of the *Spindle* are generally of this propos'd size; and therefore a convenient strength of Mettal may be had on this size for four *Worms*; But should the Diameter of the *Spindle* be smaller, as they sometimes are when the *Press* is designed for small Work, only three *Worms* will

will be a properer number than four ; because when the Diameter is small, the thickness of the *Worms* would also prove small, and by the stress of a *Pull* would be more subject to break or tear the *Worms* either of the *Spindle* or *Nut*.

And thus I hope I have performed the promise here I made at the latter end of *Numb. 2.* Whether I refer you for the breadth, and reason of the breadth of the *Worm*.

¶ 13. *Of the Bar marked B in Plate 8.*

This *Bar* is Iron, containing in length about two Foot eight Inches and an half, from *a* to *b*, and its greatest thickness, except the Sholder, an Inch and a quarter ; The end *a* hath a Male-Screw about an Inch Diameter and an Inch long, to which a *Nut* with a Female-Screw in it as at *C* is fitted. The Iron *Nut* in which this Female-Screw is made, must be very strong, viz. at least an Inch thick, and an Inch and three quarters in Diameter ; in two opposite sides of it is made two Ears, which must also be very strong, because they must with heavy blows be knock't upon to draw the Sholder of the square shank on the *Bar*, when the square Pin is in the *Eye* of the *Spindle* close and steady up to the Cube on the *Spindle*. The square Pin of the *Bar* marked *c* is made to fit just into the *Eye*, through the middle of the Cube of the *Spindle*, on the hither end of this square Pin is made a Sholder or stop to this square Pin, as at *d*. This Sholder must be Filed exactly Flat on all its four in-sides, that they may be drawn close and tight up

to any flat side of the Cube on the *Spindle*; It is two Inches square, that it may be drawn the firmer, and stop the *Steddyer* against any of the flat sides of the said Cube, when it is hard drawn by the strength of the Female-Screw in the aforesaid *Nut* at C. The thickness from *d* to *e* of this Sholder is about three quarters of an Inch, and is Bevil'd off towards the *Handle* of the *Bar* with a small Molding.

The substance of this *Bar*, as aforesaid, is about an Inch and a quarter; but its Corners are all the way flattened down till within five Inches of the end: And from these five Inches to the end, it is taper'd away, that the *Wooden-Handle* may be the stronger forced and fastned upon it.

About four Inches off the Sholder, the *Bar* is bow'd beyond a right Angle, yet not with an Angle, but a Bow, which therefore lies ready to the *Press-man's* Hand, that he may Catch at it to draw the *Wooden-Handle* of the *Bar* within his reach.

This *Wooden-Handle* with long Working grows oft loose; but then it is with hard blows on the end of it forced on again, which oft splits the *Wooden-Handle* and loosens the square Pin at the other end of the *Bar*, in the *Eye* of the *Spindle*: To remedy which inconvenience, I used this Help, *viz.* To weld a piece of a Curtain-Rod as long as the *Wooden-Handle* of the *Bar*, to the end of the Iron *Bar*, and made a Male-screw at the other end with a Female-screw to fit it; Then I bored an hole quite through the *Wooden-Handle*, and Turn'd the very end of the *Wooden-Handle* with a small hollow in it flat at the bottom, and deep enough to bury the Iron-*Nut* on the end of the *Curtain-*

tain-Rod, and when this Curtain-Rod was put through the Hollow in the *Wooden Handle* and Screwed fast to it at the end, it kept the *Wooden-Handle*, from flying off; Or if it loosened, by twisting the *Nut* once or twice more about, it it was fastned again.

¶ 14. Of the Hose, Garter, and Hose-Hooks.

The *Hose* are the upright Irons in Plate 8. at *a a*, They are about three quarters of an Inch square, both their ends have Male-screws on them; The lower end is fitted into a square Hole made at the parting of the *Hose-Hooks*, which by a square *Nut* with a Female-screw in it, is Screwed tight up to them; Their upper ends are let into square Holes made at the ends of the *Garter*, and by *Nuts* with Female-Screws in them, and Ears to turn them about as at *H* are drawn up higher, if the *Plattin-Cords* are too loose; or else let down lower if they are to tight: These upper Screws are called the *Hose-Screws*.

The *Garter* (but more properly the *Coller*) marked *b b*, is the round Hoop, incompassing the flat Groove or Neck in the Shank of the *Spindle* at *e e*; This round Hoop is made of two half round Hoops, having in a Diametrical-line without the Hoop square Irons of the same piece proceeding from them, and standing out as far as *g g*; These Irons are so let into each other, that they comply and run Range with the square Sholders at both ends, wherein square Holes are made at the ends of the *Hose*. They are Screwed together with two small Screws, as at *h h*.

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The four *Hofe-Hooks* are marked *iiii*, They proceed from two Branches of an Iron Hoop at *k* encompassing the lower-end of the *Spindle*, on either Corner of the Branch, and have notches filled in their outer-sides as in the Figure, which notches are to contain several Turns of *Whip-cord* in each notch, which *Whip-cord* being also fastned to the *Hooks* on the *Plattin*, holds the *Plattin* tight to the *Hooks* of the *Hofe*.

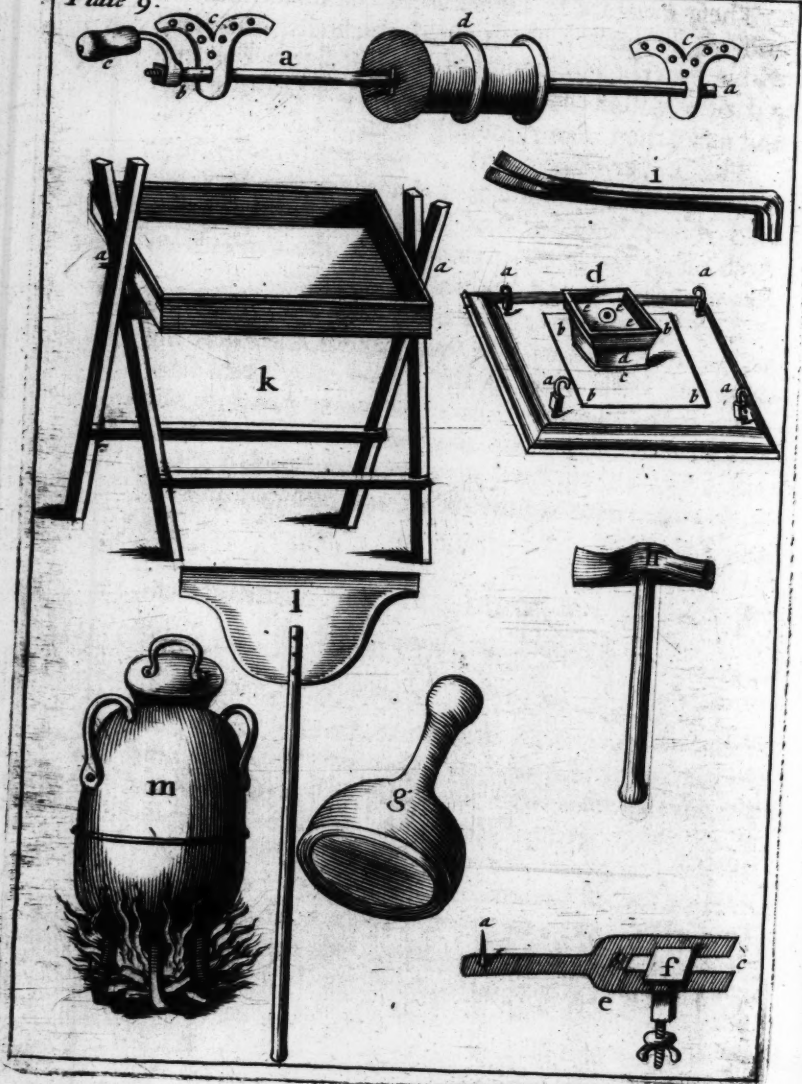
¶ 15. Of the Ribs, and Cramp-Irons.

The *Ribs* are delineated in Plate 8. at E, they are made of four-square Irons the length of the *Wooden-Ribs* and *End-Rails*, viz. Four Foot five Inches long, and three quarters of an Inch square, only one end is batter'd to about a quarter of an Inch thick, and about two Inches and an half broad, in which battering four or five holes are Punch't for the nailing it down to the *Hind-Rail* of the *Wooden-Ribs*. The Fore-end is also batter'd down as the Hind-end, but bound downwards to a square, that it may be nailed down on the outer-side of the *Fore-Rail* of the *Wooden-Ribs*.

Into the bottom of these *Ribs*; within nine Inches of the middle, on either side is made two Female-Dustails about three quarters of an Inch broad, and half a quarter of an Inch thick, which Female-Dustails have Male-Dustails as at *a a a a* fitted stiff into them; about an Inch and three quarters long; and these Male-Dustails have an hole punched at either end, that when they are fitted into the Female-Dustails in the *Ribs*, they may in these Holes be Nailed down the firmer to the *Wooden-Ribs*. These

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Plate 9.



These *Ribs* are to be between the upper and the under side exactly of an equal thickness, and both to lye exactly Horizontal in straight lines; For irregularities will both Mount and Sink the *Cramp-Irons*, and make them *Run* rumbling upon the *Ribs*.

The upper-sides of these *Ribs* must be purely Smooth-fil'd and Polish'd, and the edges a little Bevil'd roundish away, that they may be somewhat Arching at the top; because then the *Cramp-Irons* *Run* more easily and ticklishly over them.

The *Cramp-Irons* are marked F in Plate 8. They are an Inch and an half long besides the Battering down at both ends as the *Ribs* were; They have three holes Punched in each Battering down, to Nail them to the *Planck* of the *Coffin*; They are about half an Inch deep, and one quarter and an half thick; their upper-sides are smoothed and rounded away as the *Ribs*.

¶ 16. Of the Spindle for the Rounce, described in Plate 9. at a.

The *Axis* or *Spindle* is a straight Bar of Iron about three quarters of an Inch square, and is about three Inches longer than the whole breadth of the Frame of the *Ribs*, viz. two Foot two Inches: The farther end of it is Filed to a round Pin (as at *a*) three quarters of an Inch long, and three quarters of an Inch in Diameter; the hither end is filed away to such another round Pin, but is two Inches and a quarter long (as at *b*); at an Inch and a quarter from this end is Filed a Square Pin three quarters of an Inch long, and

within half an Inch of the end is Filed another round Pin, which hath another Male-Screw on it, to which is fitted a square Iron Nut with a Female-Screw in it.

On the Square Pin is fitted a *Winch* somewhat in form like a Jack-winch, but much stronger; the *Eye* of which is fitted upon the Square aforesaid, and Screwed up tight with a Female-Screw. On the straight Shank of this Winch is fitted the *Round*, marked *e*.

The round ends of this *Axis* are hung up in two Iron-Sockets (as at *c c*) fastned with Nails (but more properly with Screws) on the outside the Wooden Frame of the *Ribs*.

The *Girt-Barrel* marked *d* is Turned of a Piece of Maple or Alder-wood, of such a length, that it may play easily between the two Wooden *Ribs*; and of such a diameter, that in one revolution of it, such a length of *Girt* may wind about it as shall be equal to half the length contained between the fore-end Iron of the *Tympan*, and the inside of the Rail of the *Inner-Tympan*; because two Revolutions of this *Barrel* must move the *Carriage* this length of space.

This *Barrel* is fitted and fastned upon the Iron *Axis*, at such a distance from either end, that it may move round between the Wooden *Ribs* aforesaid.

¶ 17. Of the Press-Stone.

The *Press-Stone* should be Marble, though sometimes Master *Printers* make shift with Purbeck, either because they can buy them cheaper, or else because they can neither distinguish them by their appearance, or know their different worths.

Its thickness must be all the way throughout equal

qual, and ought to be within one half quarter of an Inch the depth of the inside of the *Coffin*; because the matter it is *Bedded* in will raise it high enough. Its length and breadth must be about half an Inch less than the length and breadth of the inside of the *Coffin*: Because *Justifiers* of Wood, the length of every side, and almost the depth of the *Stone*, must be thrust between the insides of the *Coffin* and the outsides of the *Stone*, to Wedge it tight and steddly in its place; after the *Press-man* has *Bedded* it. Its upper-side, or Face must be exactly straight and smooth.

I have given you this description of the *Press-Stone*, because they are thus generally used in all *Printing-Houses*: But I have had so much trouble, charge and vexation with the often breaking of *Stones*, either through the carelesness or unskilfulness (or both) of *Press-men*, that necessity compell'd me to consider how I might leave them off; and now by long experience I have found, that a piece of *Lignum-vitæ* of the same size, and truly wrought, performs the office of a *Stone* in all respects as well as a *Stone*, and eases my mind, of the trouble, charge and vexation aforesaid, though the first cost of it be greater.

¶ 18. Of the Plattin marked d in Plate 9.

The *Plattin* is commonly made of Beechen Planck, two Inches and an half thick, its length about fourteen Inches, and its breadth about nine Inches. Its sides are Tryed Square, and the Face or under-side of the *Plattin* Plained exactly straight and smooth. Near the four Corners on the upper-side, it hath

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four

four Iron Hooks as at *a a a a*, whose Shanks are Wormed in,

In the middle of the upper side is let in and fastened an Iron Plate called the *Plattin-Plate*, as *b b b b*, a quarter of an Inch thick, six Inches long, and four Inches broad; in the middle of this Plate is made a square Iron Frame about half an Inch high, and half an Inch broad, as at *c*. Into this square Frame is fitted the *Stud* of the *Plattin Pan*, so as it may stand steddy, and yet to be taken out and put in as occasion may require.

This *Stud* marked *d*, is about an Inch thick, and then spreads wider and wider to the top (at *eeee*) of it, till it becomes about two Inches and an half wide; and the sides of this spreading being but about half a quarter of an Inch thick makes the *Pan*. In the middle of the bottom of this *Pan* is a small Center hole Punch'd for the *Toe* of the *Spindle* to work in.

¶ 19. Of the Points and Point-Screws.

The Points are made of Iron Plates about the thickness of a Queen Elizabeth Shilling: It is delineated at *e* in Plate 9. which is sufficient to shew the shape of it, at the end of this Plate, as at *a*, stands upright the Point. This Point is made of a piece of small Wyer about a quarter and half quarter of an Inch high, and hath its lower end Filed away to a small Shank about twice the length of the thickness of the Plate; so that a Shoulder may remain. This small Shank is fitted into a small Hole made near the end of the Plate, and Revetted on the other side, as was taught

taught *Numb. 2. Fol. 24.* At the other end of the Plate is filed a long square notch in the Plate as at *b c* quarter and half quarter Inch wide, to receive the square shank of the *Point-Screws*.

The *Point-Screw* marked *f* is made of Iron; It hath a thin Head about an Inch square, And a square Shank just under the Head, an Inch deep, and almost quarter and half quarter Inch square, that the square Notch in the hinder end of the Plate may slide on it from end to end of the Notch; Under this square Shank is a round Pin filed with a Male-Screw upon it, to which is fitted a *Nut* with a Female-Screw in it, and Ears on its out-side to twist about, and draw the Head of the Shank close down to the *Tympan*, and so hold the *Point-Plate* fast in its Place.

¶ 20. *Of the Hammer, described at h, and Sheeps-Foot described at i in Plate 9.*

The *Hammer* is a common *Hammer* about a quarter of a Pound weight; It hath no *Claws* but a *Pen*, which stands the *Press-man* instead when the *Chase* proves so big, that he is forced to use small *Quoins*.

The Figure of the *Sheeps-Foot* is description sufficient. Its use is to nail and un-nail the *Balls*.

The *Sheeps-Foot* is all made of Iron, with an *Hammer-head* at one end, to drive the *Ball Nails* into the *Ball Stocks*, and a *Claw* at the other end, to draw the *Ball-Nails* out of the *Ball-Stocks*.

¶ 21. *Of*

¶ 21. *Of the Foot-step, Girts, Stay of the Carriage, Stay of the Frisket, Ball-Stocks, Paper-Bench, Lye-Trough, Lye-Brush, Lye-Kettle, Tray to wet Paper in, Weights to Press Paper, Pelts, or Leather, Wool or Hair, Ball-Nails or Pumping-Nails.*

The *Foot Step* is an Inch-Board about a Foot broad, and sixteen Inches long. This Board is nailed upon a piece of Timber about seven or eight Inches high, and is Bevil'd away on its upper-side, as is also the Board on its under-side at its hither end, that the Board may stand aslope upon the Floor. It is placed fast on the Floor under the Carriage of the Press. Its Office shall be shew'd when we come to treat of Exercise of the *Press-man*.

Girts are Thongs of Leather, cut out of the Back of an Horse-hide, or a Bulls hide, sometimes an Hogs-hide. They are about an Inch and an half, or an Inch and three quarters broad. Two of them are used to carry the Carriage out and in. These two have each of them one of their ends nailed to the Barrel on the Spindle of the Rounce, and the other ends nailed to the Barrel behind the Carriage in the Planck of the Coffin, and to the Barrel on the fore-end of the Frame of the Coffin.

The *Stay* of the Carriage is sometimes a piece of the same Girt fastned to the outside of the further Cheek, and

and to the further hinder side of the Frame of the *Carriage*. It is fastned at such a length by the *Press man*, that the *Carriage* may ride so far out, as that the Irons of the *Tympan* may just rise free and clear off the fore-side of the *Plattin*.

Another way to stay the *Carriage* is to let an Iron Pin into the upper-side of the further Rail of the Frame of the *Ribs*, just in the place where the further hinder Rail of the *Carriage* stands projecting over the *Rib-Rail*, when the Iron of the *Tympan* may just rise free from the Fore-side of the *Plattin*; for then that projecting will stop against the Iron Pin.

The *Stay* of the *Frisket* is made by fastning a Batten upon the middle of the Top-side of the *Cap*, and by fastning a Batten to the former Batten perpendicularly downwards, just at such a distance, that the upper-side of the *Frisket* may stop against it when it is turned up just a little beyond a Perpendicular. When a *Press* stands at a convenient distance from a Wall, that Wall performs the office of the aforesaid *Stay*.

Ball-Stocks are Turn'd of *Alder* or *Maple*. Their Shape is delineated in Plate 9. at g: They are about seven Inches in Diameter, and have their under side Turned hollow, to contain the greater quantity of *Wool* or *Hair*, to keep the *Ball-Leathers* plump the longer.

The *Lye-Trough* (delineated in Plate 9. at k) is a Square Trough made of Inch-Boards; about four Inches deep, two Foot four Inches long, and one Foot nine Inches broad, and flat in the Bottom. Its inside is Leaded with Sheet-Lead, which reaches up over the upper Edges of the *Trough*. In the middle of the two ends (for so I call the shortest sides) on the outer sides as *a a*, is fastned a round Iron Pin, which

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moves

moves in a round hole made in an Iron Stud with a square Sprig under it, to be drove and fastned into a *Wooden Horse*, which *Horse* I need not describe, because in Plate aforesaid I have given you the Figure of it.

The *Paper-Bench* is only a common Bench about three Foot eight Inches long, one Foot eight Inches broad, and three Foot four Inches high.

The *Lye Brush* is made of *Hogs-Bristles* fastned into a Board with Brass Wyer, for durance sake: Its Board is commonly about nine Inches long, and four and an half Inches broad; and the length of the Bristles about three Inches.

To perform the Office of a *Lye-Kettle* (which commonly holds about three Gallons) the old-fashioned *Chafers* are most commodious, as well because they are more handy and manageable than *Kettles* with Bails, as also because they keep *Lye* longer hot.

The *Tray to Wet Paper* in is only a common Butchers Tray, large enough to *Wet* the largest *Paper* in.

The *Weights to Press Paper* with, is either Mettal, or Stone, flat on the Bottom, to ly steddly on the *Paper-Board*: It must be about 50 or 60 pound weight.

For *Pelts* or *Leather*, *Ball-Nails* or *Pumping-Nails*, *Wool* or *Hair*, *Vellom* or *Parchment* or *Forrel*, the *Press-man* generally eases the *Master-Printer* of the trouble of choosing, though not the charge of paying for them: And for *Paste*, *Sallad-Oyl*, and such accidental Requisites as the *Press-man* in his work may want, the *Devil* commonly fetches for him.

¶ 22. Of Racks to Hang Paper on, and of the Peel.

Our *Master-Printer* must provide *Racks* to hang *Paper* on to *Dry*: They are made of Deal-board Battens, square,

square, an Inch thick, and an Inch and an half deep, and the length the whole length of the Deal, which is commonly about ten or eleven Foot long, or else so long as the convenience of the Room will allow: The two upper corners of these *Rails* are rounded off that they may not mark the *Paper*.

These *Racks* are Hung over Head, either in the *Printing-House*, or *Ware-house*, or both, or any other Room that is most convenient to *Dry Paper* in; they are hung a-thwart two *Rails* an Inch thick, and about three or four Inches deep, which *Rails* are fastned to some Joysts or other Timber in the Ceiling by Stiles perpendicular to the Ceiling; These *Rails* stand so wide assunder, that each end of the *Racks* may hang beyond them about the distance of two Foot, and have on their upper edge at ten Inches distance from one another, so many square Notches cut into them as the whole length of the *Rail* will bear; Into these square notches the *Racks* are laid parallel to each other with the flat side downwards, and the Rounded off side upwards.

The *Peel* is described in Plate 9. at 1, which Figure sufficiently shews what it is; And therefore I shall need say no more to it, only its Handle may be longer or shorter according as the height of the Room it is to be used in may require.

¶ 23. Of Inck.

The providing of good *Inck*, or rather good *Varnish* for *Inck*, is none of the least incumbent cares upon our *Master-Printer*, though Custom has almost made it so here in *England*; for the process of making *Inck* being as well laborious to the Body, as noy-

some and ungrateful to the Sence, and by several odd accidents dangerous of Firing the Place it is made in, Our *English Master-Printers* do generally discharge themselves of that trouble; and instead of having good *Inck*, content themselves that they pay an *Inck-maker* for good *Inck*, which may yet be better or worse according to the Conscience of the *Inck-maker*.

That our Neighbours the *Hollanders* who exhibit Patterns of good *Printing* to all the World, are careful and industrious in all the circumstances of good *Printing*, is very notorious to all Book-men; yet should they content themselves with such *Inck* as we do, their Work would appear notwithstanding the other circumstances they observe, far less graceful than it does, as well as ours would appear more beautiful if we used such *Inck* as they do: for there is many Reasons, considering how the *Inck* is made with us and with them, why their *Inck* must needs be better than ours. As *First*, They make theirs all of good old *Linseed-Oyl* alone, and perhaps a little *Rosin* in it sometimes, when as our *Inck-makers* to save charges mingle many times *Trane-Oyl* among theirs, and a great deal of *Rosin*; which *Trane-Oyl* by its grossness, Furs and Choaks up a *Form*, and by its fatness hinders the *Inck* from drying; so that when the Work comes to the *Binders*, it *Sets off*; and besides is dull, smeary and unpleasant to the Eye. And the *Rosin* if too great a quantity be put in, and the *Form* be not very *Lean Beaten*, makes the *Inck* turn yellow: And the same does New *Linseed-Oyl*.

Secondly, They seldom *Boyl* or *Burn* it to that consistence the *Hollanders* do, because they not only save labour and Fewel, but have a greater weight of *Inck*

out of the same quantity of *Oyl* when less *Burnt* away than when more *Burnt* away; which want of Burning makes the *Inck* also, though made of good old *Linseed Oyl*, Fat and Smeary, and hinders its *Drying*; so that when it comes to the *Binders* it also *Sets off*.

Thirdly, They do not use that way of clearing their *Inck* the *Hollanders* do, or indeed any other way than meer Burning it, whereby the *Inck* remains more *Oily* and *Greasy* than if it were well clarified.

Fourthly, They to save the *Press-man* the labour of Rubbing the *Blacking* into *Varnish* on the *Inck-Block*, Boil the *Blacking* in the *Varnish*, or at least put the *Blacking* in whilst the *Varnish* is yet *Boiling-hot*, which so Burns and Rubifies the *Blacking*, that it loses much much of its brisk and vivid black complexion.

Fifthly, Because *Blacking* is dear, and adds little to the weight of *Inck*, they stint themselves to a quantity which they exceed not; so that sometimes the *Inck* proves so unsufferable *Pale*, that the *Press-man* is forc'd to Rub in more *Blacking* upon the *Block*; yet this he is often so loth to do, that he will rather hazard the content the Colour shall give, than take the pains to amend it: satisfying himself that he can lay the blame upon the *Inck-maker*.

Having thus hinted at the difference between the *Dutch* and *English Inck*, I shall now give you the Receipt and manner of making the *Dutch-Varnish*.

They provide a *Kettle* or a *Caldron*, but a *Caldron* is more proper, such an one as is described in Plate 9. at m. This Vessel should hold twice so much *Oyl* as they intend to Boil, that the *Scum* may be some considerable time a *Rising* from the top of the *Oyl* to the top of the Vessel to prevent danger. This Cal-

dron hath a Copper Cover to fit the Mouth of it, and this Cover hath an Handle at the top of it to take it off and put it on by. This *Caldron* is set upon a good strong Iron *Trevet*, and fill'd half full of old *Linseed-Oyl*, the older the better, and hath a good Fire made under it of solid matter, either *Sea Coal*, *Charcoal* or pretty big Chumps of Wood that will burn well without much Flame; for should the Flame rise too high, and the *Oyl* be very hot at the taking off the Cover of the *Caldron*, the fume of the *Oyl* might be apt to take Fire at the Flame, and endanger the loss of the *Oyl* and Firing the House: Thus they let *Oyl* heat in the *Caldron* till they think it is Boyling-hot; which to know, they peel the outer Films of an *Oynion* off it, and prick the *Oynion* fast upon the end of a small long Stick, and so put it into the heating *Oyl*: If it be Boyling-hot, or almost Boyling-hot, the *Oynion* will put the *Oyl* into a Fermentation, so that a Scum will gather on the top of the *Oyl*, and rise by degrees, and that more or less according as it is more or less Hot: But if it be so very Hot that the Scum rises apace, they quickly take the *Oynion* out, and by degrees the Scum will fall. But if the *Oyl* be Hot enough, and they intend to put any *Rosin* in, the quantity is to every Gallon of *Oyl* half a Pound, or rately a whole Pound. The *Rosin* they beat small in a *Mortar*, and with an Iron Ladle, or else by an Handful at a time strew it in gently into the *Oyl* lest it make the Scum rise too fast; but every Ladle-full or Handful they put in so leasurely after one another, that the first must be wholly dissolv'd before they put any more in; for else the Scum will Rise too fast, as afore said: So that
you

You may perceive a great care is to keep the Scum down; For if it Boyl over into the Fire never so little, the whole Body of Oyl will take Fire immediately.

If the Oyl be Hot enough to Burn, they Burn it, and that so often till it be Hard enough, which sometimes is six, seven, eight times, or more.

To Burn it they take a long small Stick, or double up half a Sheet of Paper; and light one end to set Fire to the Oyl; It will presently Take if the Oyl be Hot enough, if not, they Boyl it longer, till it be.

To try if it be Hard enough, they put the end of a Stick into the Oyl, which will lick up about three or four drops, which they put upon an Oyſter-shell, or some such thing, and set it by to cool, and when it is cold they touch it with their Fore or Middle-Finger and Thumb, and try its consistence by sticking together of their Finger and Thumb; for if it draw stiff like strong Turpentine it is Hard enough, if not, they Boyl it longer, or Burn it again till it be so consolidated.

When it is well Boyled they throw in an Ounce of Letharge of Silver to every four Gallons of Oyl to Clarifie it, and Boyl it gently once again, and then take it off the Fire to stand and cool, and when it is cool enough to put their Hand in, they Strain it through a Linnen Cloath, and with their Hands wring all the Varnish out into a Leaded Stone Pot or Pan, and keeping it covered, set it by for their use; The longer it stands by the better, because it is less subject to turn Yellow on the Paper that is Printed with it.

This is the Dutch way of making Varnish, and the way the English Inck-makers ought to use.

Note, First, That the Varnish may be made without Burning the Oyl, viz. only with well and long Boyl,

Boyling it; for *Burning* is but a violent way of *Boyling*, to consolidate it the sooner.

Secondly, That an *Apple* or a *Crust* of *Bread*, &c. stuck upon the end of a *Stick* instead of an *Oymion* will also make the *Scum* of the *Oyl* rise: For it is only the *Air* contained in the *Pores* of the *Apple*, *Crust* or *Oymion*, &c. pressed or forced out by the violent heat of the *Oyl*, that raises the many *Bubbles* on the top of the *Oyl*: And the connection of those *Bubbles* are vulgarly called *Scum*.

Thirdly, The English *Inck-makers* that often make *Inck*, and that in great quantities, because one Man may serve all *England*, instead of setting a *Caldron* on a *Trevel*, build a *Furnace* under a great *Caldron*, and Trim it about so with *Brick*, that it Boils far sooner and more securely than on a *Trevel*; because if the *Oyl* should chance to Boil over, yet can it not run into the *Fire*, being Fenced round about with *Brick* as aforesaid, and the *Stoking-hole* lying far under the *Caldron*.

Fourthly, When for want of a *Caldron* the *Master-Printer* makes *Varnish* in a *Kettle*, He provides a great piece of thick *Canvass*, big enough when three or four double to cover the *Kettle*, and also to hang half round the sides of the *Kettle*: This *Canvass* (to make it more soluble) is wet in *Water*, and the *Water* well wrung out again, so that the *Canvass* remains only moist: Its use is to throw flat over the Mouth of the *Kettle* when the *Oyl* is *Burning*, to keep the smoak in, that it may stifle the *Flame* when they see cause to put it out. But the *Water* as was said before, must be very well wrung out of the *Canvass*, for should but a drop or two fall from the sides of it into the *Oyl* when it is *Burning*, it will so enrage the *Oyl*, and raise the *Scum*, that it might endanger the working over the top of the *Kettle*.

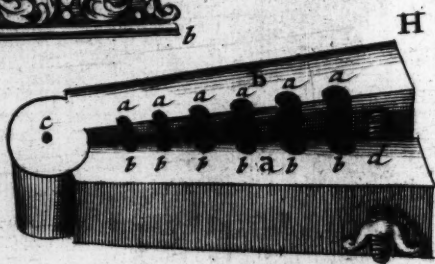
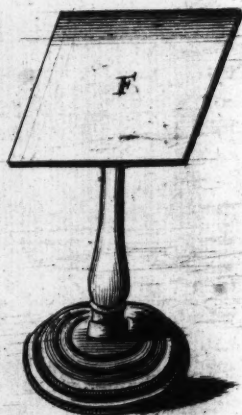
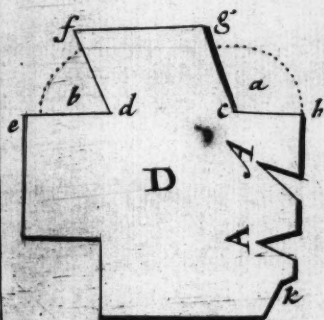
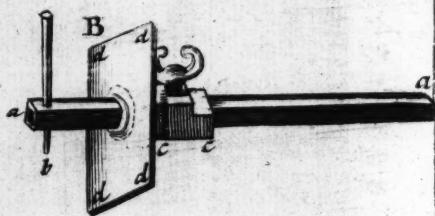
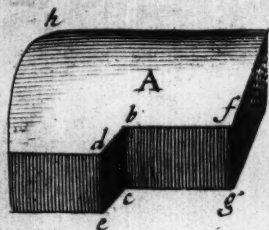
Having shewn you the *Master-Printers* Office, I account it suitable to proper Method, to let you know how the *Letter-Founder* Cuts the *Punches*, how the *Molds* are made, the *Matrices* Sunck, and the *Letter Cast* and *Drest*, for all these Operations precede the *Compositors* Trade, as the *Compositors* does the *Pressmans*; wherefore the next *Exercises* shall be (God willing) upon *Cutting* of the *Steel-Punches*

ME-

Num: 7. 8. 9.

20

Plate 10.



MECHANICK EXERCISES:

Or, the Doctrine of

Handy-works.

Applied to the Art of

Letter-Cutting.**The Second VOLUME.**

P R E F A C E.

Letter-Cutting is a Handy-Work hitherto kept so conceal'd among the Artificers of it, that I cannot learn any one hath taught it any other; But every one that has used it, Learnt it of his own Genuine Inclination. Therefore, though I cannot (as in other Trades) describe the general Practice of Work-men, yet the Rules I follow I shall shew here, and have as good an Opinion of these Rules, as those have that are shyest of discovering theirs. For, indeed, by the appearance of some Work done, a judicious Eye may doubt whether they go by any Rule at all, though Geometrick Rules, in no Practice whatever, ought to be more nicely or exactly observed than in this.

§. 12. ¶. 1. *Of Letter-Cutters Tools.*

THe making of *Steel Punches* is a Branch of the *Smith's Trade*: For, as I told you in the Preface to *Numb. 1.* The *Black-Smith's Trade* comprehends all Trades that use either *Forge* or *File*, from the *Anchor-Smith*, to the *Watch-maker*: They all working by the same Rules, though not with equal exactness; and all using the same Tools, though of different Sizes from those the Common *Black-Smith* uses; and that according to the various purposes they are applied, &c. Therefore, indeed, a *Letter-Cutter* should have a *Forge* set up, as by *Numb. 1.* But some *Letter-Cutters* may seem to scorn to use a *Forge*, as accounting it too hard Labour, and *Ungenteel* for themselves to officiate at. Yet they all well know, that though they may have a common *Black-Smith* perform their much and heavy Work, that many times a *Forge* of their own at Hand would be very commodious for them in several accidental little and light Jobs, which (in a Train of Work) they must meet withal.

But if our *Letter-Cutter* will have no *Forge*, yet he must of necessity accommodate himself with a *Vice*, *Hand-Vice*, *Hammers*, *Files*, *Small* and *Fine Files* (commonly called *Watch-makers Files*) of these he saves all, as they wear out, to smooth and burnish the Sides and Face of his Letter with, as shall be shewed; *Gravers*, and *Sculpters* of all sorts, an *Anvil*, or a *Stake*, an *Oyl-stone*, &c. And of these, such as are suitable and fizable to the several Letters he

he is to Cut. These, or many of these Tools, being described in *Numb. 1.* I refer my Reader thither, and proceed to give an account of some Tools peculiar to the *Letter-Cutter*, though not of particular use to the Common *Black-Smith*.

¶ 2. *Of the Using-File.*

This *File* is about nine or ten Inches long, and three or four Inches broad; and three quarters of an Inch thick: The two broad sides must be exactly flat and straight: And the one side is commonly cut with a *Bastard-Cut*, the other with a *Fine* or *Smooth-Cut*. (See *Numb. 1. Fol. 14, 15.*) Its use is to *Rub* a piece of Steel, Iron, or Brass, &c. flat and straight upon, as shall be shewed hereafter.

In chusing it, you must see it be exactly Flat and Straight all its Length and Breadth: For if it in any part Belly out, or be Hollow inwards, what is Rubbed upon it will be Hollow, Rubbing on the Bellying part; and Bellying, Rubbing on the Hollow part. You must also see that it be very Hard; and therefore the thickest *Using-Files* are likeliest to prove best, because the thin commonly Warp in Hardning.

¶ 3. *Of the Flat-Gage.*

The *Flat-Gage* is described in *Plate 10. at A.* It is made of a flat piece of Box, or other Hard Wood. Its Length is three Inches and an half, its Breadth two Inches and an half, and its Thickness one Inch and

an half. This is on the Flat, first made Square, but afterwards hath one of its Corners (as *b*) a little rounded off, that it may the easier comply with the Ball of the Hand. Out of one of its longest Sides, *viz.* that not rounded off, is Cut through the thickness of it an exact Square, whose one side *b f*, *c g* is about an Inch and three quarters long; and its other side *b d*, *c e* about half an Inch long. The Depth of these Sides and their Angle is exactly Square to the top and bottom of the upper and under Surfaces of the *Flat-Gage*.

Its Use is to hold a Rod of Steel, or Body of a *Mold*, &c. exactly perpendicular to the Flat of the *Using-File*, that the end of it may rub upon the *Using-File*, and be Filed away exactly Square, and that to the Shank; as shall more at large be shewed in §. 2. ¶. 3.

¶. 4. *Of the Sliding Gage.*

The *Sliding Gage* is described in *Plate 10.* at *Fig. B.* It is a Tool commonly used by *Mathematical Instrument-Makers*, and I have found it of great use in *Letter-Cutting*, and making of *Molds*, &c. *aa* the Beam, *b* the Tooth, *cc* the Sliding Socket, *d d d* the Shoulder of the Socket.

Its Use is to measure and set off Distances between the Shoulder and the Tooth, and to mark it off from the end, or else from the edge of your Work.

I always use two or three of these *Gages*, that I need not remove the Shoulder when it is set to a Distance which I may have after-use for; as shall in Working be shewed more fully.

¶ 5. Of the Face-Gages, marked C in Plate 10.

The *Face-Gage* is a Square Notch cut with a File into the edge of a thin Plate of Steel, Iron, or Brass, the thickness of a piece of common Latton, and the Notch about an *English* deep. There be three of these Gages made, for the Letters to be cut on one Body; but they may be all made upon one thin Plate, the readier to be found, as at D. As first, for the Long Letters; Secondly, for the Ascending Letters; And Thirdly, for the Short Letters. The Length of these several Notches, or Gages, have their Proportions to the Body they are cut to, and are as follows. We shall imagine (for in Practice it cannot well be perform'd, unless in very large Bodies) that the Length of the whole Body is divided into forty and two equal Parts.

The *Gage* for the Long Letters are the length of the whole Body, *viz.* forty and two equal Parts. The *Gage* for the Ascending Letters, *Roman* and *Italica*, are five Seventh Parts of the Body, *viz.* thirty Parts of Forty two, and thirty and three Parts for *English* Face. The *Gage* for the Short Letters are three Seventh Parts of the whole Body, *viz.* eighteen Parts of Forty two for the *Roman* and *Italica*, and twenty two Parts for the *English* Face.

It may indeed be thought impossible to divide a Body into seven equal Parts, and much more difficult to divide each of those seven equal Parts into six equal Parts, which are Forty two, as aforesaid, especially if the Body be but small; but yet it is

possible with curious Working: For seven thin Spaces may be Cast and Rubb'd to do it. And for dividing each of the thin Spaces into six equal Parts, you may Cast and Rub Full Point . to be of the thickness of one thin Space, and one sixth part of a thin Space: And you may Cast and Rub : to be the thickness of one thin Space, and two sixth parts of a thin Space: And you may Cast and Rub , to be the thickness of one thin Space, and three sixth parts of a thin Space: And you may Cast and Rub - to be the thickness of one thin Space, and four sixth parts of a thin Space: And you may Cast and Rub ; to be the thickness of one thin Space, and five sixth parts of a thin Space.

The reason why I propose . to be Cast and Rubb'd one sixth part thicker than a thin Space, is only that it may be readily distinguished from : , - ; which are two sixth parts, three sixth parts, four sixth parts, five sixth parts thicker than a thin Space. And for six sixth parts thicker than a thin Space, two thin Spaces does it.

The manner of adjusting these several Sixth Parts of Thicknesses is as follows. You may try if six . exactly agree, and be even with seven thin Spaces ; (or, which is all one, a Body) for then is each of those six . one sixth part thicker than a thin Space, because it drives out a thin Space in six thin Spaces. And you may try if six : be equal to a Body and one thin Space ; for then is each : two sixth parts thicker than a thin Space. If six , be equal to nine thin Spaces, then each , is three sixth parts of a thin Space thicker than a thin Space. If six - be

be equal to ten thin Spaces, then each - is four sixth parts of a thin Space thicker than a thin Space. If six ; be equal to eleven thin Spaces, then each ; is five sixth parts of a thin Space thicker than a thin Space.

Now, as aforesaid, a thin Space being one seventh part of the Body, and the thin Space thus divided, you have the whole Body actually divided into forty and two equal parts, as I have divided them in my Drafts of Letters down the Sides, and in the Bottom Line.

Though I have thus shewed how to divide a thin Space into six equal Parts, yet when the Letter to be Cut proves of a small Body, the thin Space divided into two equal Parts may serve: If it prove bigger, into three or four equal Parts: And of the the largest Bodies, they may be divided into six, as aforesaid.

If now you would make a *Gage* for any number of thin Spaces and Sixth Parts of a thin Space, you must take one thin Space less than the number of thin Spaces proposed, and add . : , - ; according as the number of sixth Parts of a thin Space require ; and to those complicated Thicknesses you may file a square Notch on the edge of the thin Plate aforesaid, which shall be a standing *Gage* or Measure for that number of thin Spaces and sixth Parts of a thin Space.

All the Exception against this way of Measuring is, that thin Spaces cast in Metal may be subject to bow, and so their Thicknesses may prove deceitful. But, in Answer to that, I say, you may, if you will, Cast

Cast I for two thin Spaces thick, e for three thin Spaces thick, S for four thin Spaces thick, L for five thin Spaces thick, D for six thin Spaces thick, or any other Letters near these several Thicknesses, as you think fit; only remember, or rather, make a Table of the number of thin Spaces that each Letter on the Shank is Cast for. And by complicating the Letters and Points, as aforesaid, you will have any Thickness, either to make a Gage by, or to use otherwise.

On the other Edge of the *Face-Gage* you may file three other Notches, of the same Width with those on the former Edge, for the Long, the Ascending, and Short Letters. But though the two sides of each of these Notches are parallel to each other, yet is not the third side square to them, but hath the same Slope the *Italick* hath from the *Roman*; as you may see in the Figure at *b b b*.

¶ 6. Of *Italick*, and other Standing Gages.

These *Gages* are to measure (as aforesaid) the Slope of the *Italick* Stems, by applying the Top and Bottom of the *Gage* to the Top and Bottom Lines of the Letters, and the other Side of the *Gage* to the Stem: for when the Letter complies with these three sides of the *Gage* that Letter hath its true Slope.

The manner of making these *Gages* (and indeed all other *Angular Gages*) is thus.

Place one Point of a Pair of Steel *Dividers* upon the thin Plate aforesaid, at the Point *c* or *d* (in Fig.

Fig. D in *Plate 10.* and with the other Point describe a small fine Arch of a Circle; as, *e f* or *g h*. In this Arch of the Circle must be set off on the *Gage a* 110 Degrees, and on the *Gage b* 70 Degrees, and draw from the Centres *c* and *d* two straight Lines through those numbers of Degrees: Then Filing away the Plate between the two Lines, the *Gages* are finished.

To find the Measure of this, or any other number of Degrees, do thus; Describe a Circle on a piece of Plate-Brass of any Radius (but the larger the better) draw a straight Line exactly through the Centre of this Circle, and another straight Line to cut this straight Line at right Angles in the Centre, through the Circle; so shall the Circle be divided into four Quadrants: Then fix one Foot of your Compasses (being yet unstirr'd) in one of the Points where any of the straight Lines cuts the Circle, and extend the moving Foot of your Compasses where it will fall in the Circle, and make there a Mark, which is 60 Degrees from the fixed Foot of the Compasses: Then fix again one Foot of your Compasses in the Intersection of the straight Line and Circle that is next the Mark that was made before, and extend the moving Foot in the same Quadrant towards the straight Line where you first pitch'd the Foot of your Compasses, and with the moving Foot make another Mark in the Circle. These two Marks divide the Quadrant into three equal Parts: The same way you may divide the other three Quadrants; so shall the whole Circle be divided into twelve equal Parts; and each of these twelve equal parts contain

tain an Arch of thirty Degrees: Then with your Dividers divide each of these 30 Degrees into three equal Parts, and each of these three equal Parts into two equal Parts, and each of these two equal Parts into five equal Parts, so shall the Circle be divided into 360 equal Parts, for your use.

To use it, describe on the Centre of the Circle an Arch of almost a Semi-Circle: This Arch must be exactly of the same Radius with that I prescribed to be made on the *Gages a b*, from *e* to *f*, and from *g* to *h*; then count in your Circle of Degrees from any Diametral Line 110 Degrees; and laying a straight Ruler on the Centre, and on the 110 Degrees aforesaid, make a small Mark through the the small Arch; and placing one Foot of your Compasses at the Intersection of the small Arch, with the Diametral Line, open the other Foot to the Mark made on the small Arch for 110 Degrees, and transfer that Distance to the small Arch made on the *Gage*: Then through the Marks that the two Points of your Compasses make in the small Arch on the *Gage*, draw two straight Lines from the Centre *c*: and the Brads between those two straight Lines being filed away, that *Gage* is made. In like manner you may set off any other number of Degrees, for the making of any other *Gage*.

In like manner, you may measure any Angle in the Drafts of Letters, by describing a small Arch on the Angular Point, and an Arch of the same Radius on the Centre of your divided Circle: For then, placing one Foot of your Compasses at the Intersection of the small Arch with either of the straight
Lines

Lines proceeding from the Angle in the Draft, and extending the other Foot to the Interfection of the small Arch, with the other straight Line that proceeds from the Angle, you have between the Feet of your Compasses, the Width of the Angle; and by placing one Foot of your Compasses at the Interfection of any of the straight Lines that proceed from the Centre of the divided Circle, and the small Arch you made on it, and making a Mark where the other Foot of your Compasses falls in the said small Arch, you may, by a straight Ruler laid on the Centre of the divided Circle, and the Mark on the small Arch, see in the Limb of the Circle the number of Degrees contained between the Diametral, or straight Line and the Mark.

If you have already a dividing-Plate of 360 Degrees, of a larger Radius than the Arch on your Gage, you may save your self the labour of dividing a Circle (as aforesaid,) and work by your dividing-Plate as you were directed to do with the Circle that I shewed you to divide.

In these Documents I have exposed my self to a double Censure; First, of *Geometricians*: Secondly, of *Letter-Cutters*. *Geometricians* will censure me for writing anew that which almost every young Beginner knows: And *Letter-Cutters* will censure me for proposing a Rule for that which they dare pretend they can do without Rule.

To the *Geometricians* I cross the Cudgels: yet I writ this not to them; and I doubt I have written superfluously to *Letter-Cutters*, because I think few of them either will or care to take pains to understand

these small Rudiments of *Geometry*. If they do, and be ingenious, they will thank me for discovering this Help in their own Way, which few of them know. For by this Rule they will not only make Letters truer, but also quicker, and with less care; because they shall never need to stamp their *Counter-Punch* in Lead, to see how it pleases them; which they do many times, before they like their *Counter-Punch*, be it of A A V v W w V W, and several other Letters) and at last finish their *Counter-Punch* but with a good Opinion they have that it may do well, though they frequently see it does not in many Angular Letters on different Bodies Cut by the same Hand. And were *Letter-Cutting* brought to so common Practice as *Joyner*y, *Cabinet-making*, or *Mathematical Instrument-making*, every young Beginner should then be taught by Rules, as they of these Trades are; because *Letter-Cutting* depends as much upon Rule and Compass as any other Trade does.

You may in other places, where you find most Convenience (as at *i*) make a Square, which may stand you in stead for the Squaring the Face and Stems of the *Punch* in *Roman* Letters, and also in many other Uses.

And you may make *Gages*, as you were taught before to try the *Counter-Punches* of Angular Letters; as, A K M N V X Y Z, *Romans* and *Italicks*, *Capitals* and *Lower-Case*. But then, that you may know each distinct *Gage*, you may engrave on the several respective *Gages*, at the Angle, A A 4 &c. For by examining by the Drafts of Letters, what Angle their Insides make, you may set that Angle off, and make

make the *Gage* as you were taught before, in the *Gage* for the Slope of *Italicks*.

¶ 7. *Of the Liner.*

The *Liner* is marked E in *Plate 10*. It is a thin Plate of Iron or Brass, whose Draft is sufficient to express the Shape. The Use of it is on the under-edge *ab* (which is about three Inches long) and is made truly straight, and pretty sharp or fine; that being applied to the Face of a *Punch*, or other piece of Work, it may shew whether it be straight or no.

¶ 8. *Of the Flat-Table.*

The *Flat-Table* at F in *Plate 10*. The Figure is there sufficient. All its Use is the Table F, for that is about one Inch and an half square, and on its Superficies exactly straight and flat. It is made of Iron or Brass, but Brass most proper. Its Use is to try if the Shank of a *Punch* be exactly Perpendicular to its Face, when the Face is set upon the *Table*; for if the Shank stand then directly upright to the Face of the *Table*, and lean not to any side of it, it is concluded to be perpendicular.

It hath several other Uses, which, when we come to *Casting of Letters*, and *Justifying of Matrices*, shall be shewn.

¶ 9. Of the Tach.

The *Tach* is a piece of Hard-Wood, (Box is very good) about three Inches broad, six Inches long, and three quarters of an Inch thick. About half its Length is fastned firm down upon the *Work-Bench*, and its other half projects over the hither Edge of it. It hath three or four Angular Notches on its Fore-end to rest and hold the Shank of a *Punch* steady when the End of the *Punch* is screwed in the *Hand-Vice*, and the *Hand-Vice* held in the Left Hand, while the *Work-man* Files or Graves on it with his Right Hand.

Instead of Fastning the *Tach* to the *Bench*, I Saw a square piece out of the further half of the *Tach*, that it may not be too wide for the Chaps of the *Vice* to take and screw that narrow End into the Chaps of the *Vice*, because it should be less cumbersome to my *Work-Bench*.

¶ 10. Of Furnishing the Work-Bench.

The *Work-man* hath all his great *Files* placed in Leather Nooses, with their Handles upwards, that he may readily distinguish the *File* he wants from another *File*. These Nooses are nailed on a Board that Cases the Wall on his Right Hand, and as near his *Vice* as Convenience will admit, that he may the readier take any *File* he wants.

He hath also on his Right Hand a Tin Pot, of about a Pint, with small *Files* standing in it, with their

their Handles downwards, that their Blades may be the readier seen. These small *Files* are called *Watch-makers Files*, and the *Letter-Cutter* hath occasion to use these of all Shapes, viz. *Flat, Pillar, Square, Triangular, Round, Half-Round, Knife-Files, &c.*

He also provides a shallow square Box, of about five Inches long, and three Inches broad, to lay his small Instruments in ; as, his *Gages*, his *Liner*, some common *Punches, &c.* This Box he places before him, at the further side of the *Work-Bench*.

He also provides a good *Oyl-Stone*, to sharpen his *Gravers* and *Sculpters* on. This he places at some distance from the *Vice*, on his Left Hand.

§. 13. ¶. 1. Of Letter-Cutting.

The *Letter-Cutter* does either Forge his *Steel-Punches*, or procures them to be forged; as I shewed, *Numb. 1. Fol. 8, 9, 10. in Vol. I. &c.* But great care must be taken, that the Steel be sound, and free from Veins of Iron, Cracks and Flaws, which may be discerned ; as I shewed in *Numb. 3. Vol. I.* For if there be any Veins of Iron in the Steel, when the Letter is Cut and Temper'd, and you would Sink the *Punch* into the Copper, it will batter there : Or it will Crack or Break if there be Flaws.

If there be Iron in it, it must with the Chissel be split upon a good Blood-Red-Heat in that place, and the Iron taken or wrought out ; and then with another, or more Welding Heat, or Heats, well doubled up, and laboured together, till the Steel become a sound entire piece. This Operation *Smiths* call *Well Currying of the Steel*. If

If there be Flaws in it, you must also take good Welding Heats, so hot, that the contiguous sides of the Flaws may almost Run : for then, snatching it quickly out of the Fire, you may labour it together till it become close and sound.

Mr. *Robinson*, a *Black-Smith* of *Oxford*, told me a way he uses that is ingenious, and seems rational : For if he doubts the Steel may have some small Flaws that he can scarce discern, he takes a good high Blood-Red Heat of it, and then twists the Rod or Bar (as I shewed, *Numb. 3. Vol. I.*) which Twisting winds the Flaws about the Body of the Rod, and being thus equally disposed, more or less, into the Out-sides of the Rod; according as the Position of the Flaw may be, allows an equal Heat on all sides to be taken, because the Out-sides heat faster than the In-side; and therefore the Out-sides of the Steel are not thus so subject to Burn, or Run, as if it should be kept in the Fire till the Middle, or In-side of it should be ready to Run. And when the Steel is thus well welded, and soundly laboured and wrought together with proper Heats, he afterwards reduces it to Form.

Now, that I may be the better understood by my Reader as he reads further, I have, in *Plate 10.* at *Fig. G* described the several Parts of the *Punch*; which I here explain.

G The Face.

aa, bb The Thickness.

ah, ab The Height.

ac, bc, bc The Length of the Shank, about an Inch and three quarters long.

ccc The Hammer-End.

This

This is no strict Length for the Shank, but a convenient Length ; for should the Letter Cut on the Face be small, and consequently, the Shank so too, and the Shank much longer, and it (as seldom it is) not Temper'd in the middle, it might, with Punching into Copper, bow in the middle, either with the weight of the Hammer, or with light reiterated Blows : And should it be much shorter, there might perhaps Finger-room be wanting to manage and command it while it is Punching into the Copper. But this Length is long enough for the biggest Letters, and short enough for the smallest Letters.

The Heighth and Thickness cannot be assign'd in general, because of the diversity of Bodies, and Thickness of Letters : Besides, some Letters must be Cut on a broad Face of Steel, though, when it is Cut, it is of the same Body ; as all Letters are, to which *Counter-Punches* are used ; because the Striking the *Counter-Punch* into the Face of the *Punch* will, if it have not strength enough to contain it, break or crack one or more sides of the *Punch*, and so spoil it. But if the Letter be wholly to be Cut, and not Counter-Punch'd, as I shall hereafter hint in general what Letters are not, then the Face of the *Punch* need be no bigger, or, at least, but a small matter bigger than the Letter that is to be cut upon it.

Now, If the Letter be to be Counter-punch'd, the Face of the *Punch* ought to be about twice the Heighth, and twice the Thickness of the Face of the *Counter-Punch* ; that so, when the *Counter-Punch* is struck just on the middle of the Face of the *Punch*, a

convenient Substance, and consequently, Strength of Steel on all its Sides may be contained to resist the Delitation, that the Sholder or Beard of the Counter-Punch sinking into it, would else make.

If the Letter-Cutter be to Cut a whole Set of Punches of the same Body of *Roman* and *Italica*, he provides about 240 or 260 of these Punches, because so many will be used in the *Roman* and *Italica* Capitals, and Lower-Case, Double-Letters, Smash-Letters, Accented Letters, Figures, Points, &c. But this number of Punches are to have several Heighths and Thicknesses, though the Letters to be Cut on them are all of the same Body.

What Heighth and Thickness is, I have shewed before in this §, but not what Body is; therefore I shall here explain it.

By Body is meant, in Letter-Cutters, Founders and Printers Language, the Side of the Space contained between the Top and Bottom Line of a Long Letter. As in the Draft of Letters, the divided Line on the Left Hand of A is divided into forty and two equal Parts; and that Length is the Body, thus: J being an Ascending and Descending Letter, viz. a long Letter, stands upon forty two Parts, and therefore fills the whole Body.

There is in common Use here in England, about eleven Bodies, as I shewed in §. 2. ¶. 2. of this Volume.

I told you even now, that all the Punches for the same Body must not have the same Heighth and Thickness: For some are Long; as J j Q, and several others; as you may see in the Drafts of Letters; and these long Letters stand upon the whole Heighth of the Body. The

The Ascending and Descending Letters reach from the Foot-Line, up to the Top-Line; as all the Capital Letters are Ascending Letters, and so are many of the Lower-Case Letters; as, b d f, and several others. The Descending Letters are of the same Length with the Ascending Letters; as, g p q and several others. These are contained between the Head-Line and the Bottom-Line. The Short Letters are contained between the Head-Line and the Bottom-line. These are three different Sizes of Height the *Punches* are made to, for Letters of the same Body. But in proper place I shall handle this Subject more large and distinctly.

And as there is three Heights or Sizes to be considered in Letters Cut to the same Body, so is there three Sizes to be considered, with respect to the Thicknesses of all these Letters, when the *Punches* are to be Forged: For some are m thick; by m thick is meant m *Quadrat* thick, which is just so thick as the Body is high: Some are n thick; that is to say, n *Quadrat* thick, viz. half so thick as the Body is high: And some are *Space* thick; that is, one quarter so thick as the Body is high; though Spaces are seldom Cast so thick, as shall be shewed when we come to *Casting*: and therefore, for distinction sake, we shall call these Spaces, Thick Spaces.

The first three Sizes fit exactly in Height to all the Letters of the same Body; but the last three Sizes fit not exactly in Thickness to the Letters of the same Body; for that some few among the Capitals are more than m thick, some less than m thick, and more than n thick; and some less than n thick, and

more than Space thick ; yet for Forging the *Punches*, these three Sizes are only in general Considered, with Exception had to *Æ* *H* *Q*, and most of the Swash Letters ; which being too thick to stand on an m, must be Forged thicker, according to the Work-man's Reason.

After the Work-man has accounted the exact number of Letters he is to Cut for one Set, he considers what number he shall use of each of these several Sizes in the *Roman*, and of each of these several Sizes in the *Italick* ; (for the *Punches* of *Romans* and *Italicks*, if the Body is large, are not to be Forged to the same shape, as shall be shewed by and by) and makes of a piece of Wood one Pattern of the several Sizes that he must have each number Forged to. Upon every one of these Wooden Patterns I use to write with a Pen and Ink the number of *Punches* to be Forged of that Size, lest afterwards I might be troubled with Recollections.

I say (for Example) He considers how many long Letters are m thick, how many long Letters are n thick, and how many long Letters are Space thick, in the *Roman* ; and also considers which of these must be Counter-punch'd, and which not : For (as was said before) those Letters that are to be Counter-punch'd are to have about twice the Heighth and twice the Thickness of the Face of the *Counter-Punch*, for the Reason aforesaid. But the Letters not to be Counter-punch'd need no more Substance but what will just contain the Face of the Letter ; and makes of these three Sizes three Wooden Patterns, of the exact Length, Heighth and Thickness that the Steel *Punches* are to be Forged to. He

He also counts how many are Ascenderits and Descenderits, m-thick, n-thick, and Space thick; still considering how many of them are to be Counter-punch'd, and how many not; and makes Wooden Patterns for them.

The like he does for short Letters; and makes Wooden Patterns for them, for Steel-Punches to be Forged by.

And as he has made his Patterns for the *Roman*, so he makes Patterns for the *Italick* Letters also; for the same shap'd *Punches* will not serve for *Italick*, unless he should create a great deal more Work to himself than he need do: For *Italick Punches* are not all to be Forged with their sides square to one another, as the *Romans* are; but only the highest and lowest sides must stand in Line with the highest and lowest sides of the *Roman*; but the Right and Left Hand sides stand not parallel to the Stems of the *Roman*, but must make an Angle of 20 Degrees with the *Roman* Stems: so that the Figure of the Face of the *Punch* will become a *Rhomboides*, as it is called by *Geometricians*, and the Figure of this Face is the Slope that the *Italick* Letters have from the *Roman*, as in proper place shall be further shewed. Now, should the *Punches* for these Letters be Forged with each side square to one another, the *Letter-Cutter* would be forced to spend a great deal of Time, and take great pains to File away the superfluous Steel about the Face of the Letter when he comes to the Finishing of it, especially in great Bodied Letters. Yet are not all the *Italick* Letters to be Forged on the Slope; for the *Punches* of some of them, as the

m.n., and many others, may have all, or, at least, three of their sides, square to one another, though their Sterns have the common Slope, because the ends of their Beaks and Tails lie in the same, perpendicular with the Outer Points of the Bottom and Top of their Stems, as is shewed in the Drafts of Letters.

Though I have treated thus much on the Forging of Punches, yet must all what I have said be understood only for great Bodied *Punches*; viz. from the *Great Primer*, and upwards. But for smaller Bodies; as *English*, and downwards, the *Letter-Cutter* generally, both for *Romans* and *Italicks*, gets so many square Rods of Steel, Forged out of about two or three Foot in Length, as may serve his purpose; which Rods he elects as near his Body and Sizes as his Judgment will serve him to do; and with the edge of a Half-round File, or a Cold-Chissel, cuts them into so many Lengths as he wants *Punches*. Nay, many of these Rods may serve for some of the small Letters in some of the greater Bodies; and also, for many of their *Counter-Punches*.

Having thus prepared your *Punches*, you must Neal them, as I shewed in *Numb. 3. Vol. I.*

¶ 2. Of Counter-Punches.

The *Counter-Punches* for great Letters are to be Forged as the *Letter-Punches*; but for the smaller Letters, they may be cut out of Rods of Steel, as aforesaid. They must also be well Neal'd, as the *Punches*. Then must one of the ends be Filed away
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on the out-side the Shank, to the exact shape of the in-side of the Letter you intend to Cut. For Example, If it be *A* you would Cut; This *Counter-Punch* is easie to make, because it is a Triangle; and by measuring the In-side of the Angle of *A* in the Draft of Letters, as you were taught, §. 12. ¶. 6. you may make on your Standing *Gage-Plate* a *Gage* for that Angle: So that, let the Letter to be Cut be of what Body you will, from the least, to the biggest Body, you have a Standing *Gage* for this *Counter-Punch*, so oft as you may have occasion to Cut *A*.

The *Counter-Punch* of *A* ought to be Forged Triangularly, especially towards the Punching End, and Tried by the *A Gage*, as you were taught to use the Square, Numb. 3. Vol. I. Yet, for this and other Triangular *Punches*, I commonly reserve my worn out three square Files, and make my *Counter-Punch* of a piece of one of them that best fits the Body I am to Cut.

Having by your *A-Gage* fitted the Top-Angle and the Sides of this *Counter-Punch*, you must adjust its Height by one of the three *Face-Gages* mentioned in § 12. ¶. 3. viz. by the *Ascending Face-Gage*; for *A* is an *Ascending Letter*. By Adjusting, I do not mean, you must make the *Counter-Punch* so high, as the Depth of the *Ascending Face-Gage*; because in this Letter here is to be considered the Top and the Footing, which strictly, as by the large Draft of *A* make both together five sixth Parts of a thin Space: Therefore five sixth Parts must be abated in the Height of your *Counter-Punch*, and it must be but four thin Spaces, and one sixth part of a thin Space

Space high, because the Top above the *Counter-Punch*, and the Footing below, makes five sixth Parts of a thin Space, as aforesaid.

Therefore, to measure off the Width of four thin Spaces and one sixth Part of a thin Space, lay three thin Spaces, or, which is better, the Letter *e*, which is three thin Spaces, as aforesaid; and . which is one thin Space and one sixth part of a thin Space, upon one another; for they make together, four thin Spaces, and one sixth part of a thin Space; and the thickness of these two Measures shall be the Height of the *Counter-Punch*, between the Footing and the Inner Angle of *A*. And thus, by this Example, you may couple with proper Measures either the whole Forty two, which is the whole Body, or any number of its Parts, as I told you before.

This Measure of four thin Spaces and one sixth part of a thin Space is not a Measure, perhaps, used more in the whole Set of Letters to be Cut to the present Body, therefore you need not make a *Standing Gage* for it; yet a present *Gage* you must have: Therefore use the *Sliding Gage* (described in §. 12. ¶. 4. and Plate 10. at B.) and move the Socket *cc* on the Beam *a a*, till the Edge of the Sholder of the Square of the Socket at the under-side of the Beam stands just the Width of four thin Spaces and one sixth part of a thin Space, from the Point of the Tooth *b*; which you may do by applying the Measure aforesaid just to the Square and Point of the Tooth; for then if you Screw down the Screw in the upper side of the Sliding Socket, it will fasten the Square at that distance from the Point of the Tooth.

Tooth. And by again applying the side of the Square to the Foot of the Face of the *Counter-Punch*, you may with the Tooth describe a small race, which will be the exact Height of the *Counter-Punch* for *A*. But *A* hath a Fine stroak within it, reaching from Side to Side, which by the large Draft of *A*, you may find that the middle of this cross stroak is two Thin Spaces above the bottom of this *Counter-Punch*; and with your common *Sliding-Gage* measure that distance as before, and set off that distance also on the Face of your *Counter-Punch*. Then with the edge of a Fine *Knife-File*, File straight down in that race, about the depth of a Thin Space, or somewhat more; So shall the *Counter-Punch* for *A* be finisht. But you may if you will, take off the Edges or Sholder round about the Face of the *Counter-Punch*, almost so deep as you intend to strike it into the *Punch*: for then the Face of the *Counter-Punch* being Filed more to a Point, will easier enter the *Punch* than the broad Flat-Face.

But note, That if it be a very Small Bodied *A* you would make, the Edge of a Thin *Knife-File* may make too wide a Groove: In this case you must take a peece of a well-Temper'd broken Knife, and strike its Edge into the Face of the *Counter-Punch*, as aforesaid.

¶ 3. Of Sinking the Counter-Punches.

Having thus finisht his *Counter-Punch*, he Hardens and Tempers it, as was taught Numb. 3. fol. 57, 58. Vol. I. And having also Filed the Face of his Punch

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he intends to cut his *A* upon, pretty Flat by guess, he Screws the Punch upright, and hard into the Vice: And setting the Face of his *Counter-Punch* as exactly as he can, on the middle of the Face of his Punch, he, with an Hammer suitable to the Size of his *Counter-Punch*, strikes upon the end of the *Counter-Punch* till he have driven the Face of it about two Thin Spaces deep into the Face of the Punch. So shall the *Counter-Punch* have done its Office.

But if the Letter to be *Counter-Puncht* be large, as *Great Primmer*, or upwards, I take a good high Blood red Heat of it, and Screw it quickly into the Vice; And having my *Counter-Punch* Hard, not Temper'd, because the Heat of the Punch softens it too fast: And also having before-hand the *Counter-Punch* Screwed into the *Hand-Vice* with its Shank along the Chaps, I place the Face of the *Counter-Punch* as before, on the middle of the Face of the Punch, and with an Hammer drive it in, as before.

Taking the Punch out of the Vice, he goes about to Flat and Smoothen the Face in earnest; for it had been to no purpose to Flat and Smoothen it exactly before, because the Sinking of the *Counter-Punch* into it, would have put it out of Flat again.

But before he Flats and Smoothens the Face of the Punch, He Files by guess the superfluous Steel away about the Face of the Letter, *viz.* so much, or near so much, as is not to be used when he comes to finish up the Letter, as in this present Letter *A*, which standing upon a Square Face on the Punch, meets in an Angle at the Top of the Letter. Therefore the Sides of that Square must be Filed away
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to an Angle at the Top of the Face of the Punch. But great care must be taken, that he Files not more away than he should: For he considers that the left hand Stroak of *A* is a Fat Stroak, and that both the left-hand and the right-hand Stroak too, have Footings, which he is careful to leave Steel enough in their proper places for.

The reason why these are now Fil'd thus away, and not after the Letter is finish'd, is, Because in the Flatting the Face there is now a less Body of Steel to File away, than if the whole Face of the Punch had remain'd intire: For though the following ways are quick ways to Flatten the Face, yet considering how tenderly you go to Work, and with what Smooth Files this Work must be done, the riddance made will be far less when a broad Face of Steel is to be Flatned, than when only so much, or very little more than the Face of the *Letter* only is to be Flatned.

To Flat and Smoothen the Face of the Punch, he uses the *Flat-Gage*, (described §. 12. ¶. 3. and Plate 10. at A.) thus, He fits one convex corner of the Shank of the Punch, into the Concave corner of the *Flat-Gage*, and so applies his *Flat-Gage-Punch* and all to the Face of the *Using-File*, and lets the *Counter-Punch* end, viz. the Face of the Punch Sink down to the Face of the *Using-File*: And then keeping the convex Corner of the Shank of the Punch close and steady against the Concave corner of the *Flat-Gage*, and pressing with one of his Fingers upon the then upper end of the Punch, viz. the Hammer-end, he also at the same time, presses

the lower end of the Punch, viz. The Face against the *Using-File*, and thrusts the *Flat-Gage* and *Punch* in it so oft forwards, till the extuberant Steel on the Face, be Rub'd or Fil'd away: which he knows partly by the alteration of colour and Fine Furrows made by the *Using-File* on the Face of the Punch, and partly by the falling away of the parts of the Face that are not yet toucht by the *Using-File*: So that it may be said to be truly Flat: which he knows, when the whole Face of the Punch touches upon the Flat of the *Using-File*, or at least, so much of the Face as is required in the Letter: For all Counter-Puncht-Letters, as aforesaid, must have a greater Face of Steel than what the bare Letter requires: for the reason aforesaid.

Another way I use is thus. After I have Fil'd the Face as true as I can by guess, with a *Rough-Cut-File*, I put the Punch into an Hand-Vice, whose Chaps are exactly Flat, and straight on the upper Face, and sink the Shank of the Punch so low down in the Chaps of the Hand-Vice, that the low side of the Face of the Punch may lye in the same Plain with the Chaps; which I try with the Liner. For the Liner will then shew if any of the Sides stand higher than the Plain of the Chaps: Then I Screw the Punch hard up, and File off the rising side of the Punch, which brings the Face to an exact Level: For the Face of the Chaps being Hard Steel, a File cannot touch them, but only take off the aforesaid Rising parts of the Face of the Punch, till the *Smooth-File* has wrought it all over exactly into the same Plain with the Face of the Chaps of the *Hand-Vice*.

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Some *Letter-Cutters* work them Flat by Hand, which is not only difficult, but tedious, and at the best, but done by guess.

The inconvenience that this Tool is subject to, is, That with much using its Face will work out of Flat. Therefore it becomes the Workman to examine it often, and when he finds it faulty to mend it.

When they *File* it Flat by Hand, they Screw the Shank of the Punch perpendicularly upright into the Chaps of the Vice, and with a *Flat-Bastard-Cut-File*, of about Four Inches long, or if the Punch be large, the File larger, according to discretion, and File upon the Face, as was shewn Numb. I. fol. 15, 16. Then they take it out of the Vice again, and holding up the Face Horizontally between the Sight and the Light, examine by nice observing whether none of its Angles or Sides are too high or too low. And then Screwing it in the Vice again, as before, with a *Smooth-Cut-File*, he at once both Files down the Higher Sides or Angles, and Smoothens the Face of the Punch. But yet is not this Face so perfectly Flatned, but that perhaps the middle of it rises more or less, above the Sides: And then he Screws it in his *Hand-Vice*, and leans the Shank of the Punch against the Tach, pretty near upright, and so as he may best command it, and with a *Watch-Makers Half-Round-Sharp-Cut-File*, Files upon it with the Flat-Side of his File; But so that he scarce makes his forward and backward Stroaks longer than the breadth of the Face of his Punch, lest in a long Stroak, the hinder or farther end of his File should Mount or Dip, and there-

therefore keeps his File, with the Ball of his Finger upon it, close to the Face of the Punch. Then with the Liner he examines how Flat the Face of the Punch is, and if it be not yet Flat, as perhaps it will not be in several Trials, he again reiterates the last process with the *Small-Half-Round-File*, till it be Flat. But he often Files cross the Furrows of the File, as well because it makes more riddance, as because he may better discern how the File bears on the Face of the Punch.

When it is Flat, he takes a Small well-worn Half-Round-File, and working (as before) with the *Sharp-Cut-File*, he Smoothens the Face of the Punch.

Having thus Flatted the Face of the Punch, and brought the Letter to some appearance of Form, He Screws the Punch in the Hand-Vice, but not with the Shank perpendicular to the Chaps, but so as the Side he intends to File upon may stand upwards and aslope too, and make an Angle with the Chaps of the Hand-Vice. And holding the Hand-Vice steady in his left hand, he rests the Shank of the Punch pretty near its Face upon the Tach: and then with a small *Flat-File*, called a *Pillar-File*, in his right hand, holding the Smooth Thin Side of it towards the Footing of the Stem, he Files that Stem pretty near its due Fatness, and so by several reiterated proffers, lest he should File too much of the Stem away, he brings that Stem at last to its true Fatness. Then he measures with the *Ascending Face-Gage*, the Heighth of the Letter: For though the *Counter-Punch* was imagin'd
(as

(as aforesaid) to be made to an exact Heighth for the inside of the Letter ; yet with deeper or shallower Sinking it into the *Punch*, the inside oft proves higher or lower : Because, as aforesaid, the Superficies of the Face of the *Counter-Punch* is less than the true measure. But as it runs Sholdering into the Shank of the *Counter-Punch* the Figure or Form of the inside becomes bigger than the inside of the Letter ought to be. Therefore the deeper this Sholdering Shank is sunk into the Face of the *Punch*, the higher and broader will the Form of the inside of the Letter be, and the shallower it is Sunk in, the Shorter and Narrower by the Rule of Contraries.

He measures, as I said, with the Ascending Face-Gage, and by it finds in what good Size the Letter is. If it be too high, as most commonly it is, because the Footing and Top are yet left Fat, then with several proffers he Files away the Footing and Top, bringing the Heighth nearer and nearer still, considering in his Judgment whether it be properest to File away on the Top or Footing, till at last he fits the Heighth of the Letter by the Ascending Face-Gage.

But though he have fitted the Heighth of the Letter, yet if the *Counter-Punch* were made a little too little, or Sunk a little too shallow, not only the Footing will prove too Fat, but the Triangle above the Cross-stroke of *A* will be too small ; or if too big, the Footing and part of the Top will be Filed away, when it is brought to a due Heighth, and then the Letter is Spoil'd, unless it be so deep Sunk, that

that by working away the Face, as aforesaid, he can regain the Footing and Top through the Slope-shouldering of the *Counter-Punch*, and also keep the inside of the Letter deep enough.

But if the Footing be too *Fat* or the Triangle of the Top too little in the Inside, he uses the Knife-backt Sculpter, and with one of the edges or both, that proceeds from the Belly towards the Point of the Sculpter (which edges we will for distinction sake call *Angular edges*) he by degrees and with several proffers Cuts away the Inside of the Footing, or opens the Triangle at the Top or both, till he hath made the Footing lean enough, and the Triangle big enough.

But if he works on the Triangle of the Top, he is careful not to Cut into the Straight of the Inside lines of the Stems, but to keep the Insides of that Triangle in a perfect straight line with the other part of the Inside of the Stem.

The small arch of a Circle on the Top of *A* is Fil'd away with a Sizable Round-File. And so for all other Letters that have Hollows on their Out-sides; he fits himself with a small File of that shape and Size that will fit the Hollow that he is to work upon: For thus the Tails of Swath Letters in Italick Capitals are Fil'd with half Round Files Sizable to the Hollows of them. But I instead of Round or Half-Round Files, in this Case, bespeak Pillar Files of several Thicknesses, and cause the *File-maker* to Round and Hatch the Edges: which renders the File strong and able to endure hard leaning on, without Breaking, which Round or Half-Round Files will not Bear.

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I need give no more Examples of Letters that are to be Counter-punched : And for Letters that need neither Counter-punching or Graving, they are made as the Out-sides of *A*, with Files proper to the shapes of their Stroaks.

¶ 4. *Of Graving and Sculpting the Insides of Steel Letters.*

The *Letter-Cutter* elects a *Steel Punch* or *Rod*, a small matter bigger than the Size of the Letter he is to Cut ; because the Topping or Footing Stroaks will be stronger when they are a little Bevell'd from the Face. The Face of these Letters not being to be Counter-punched are first Flatned and Smoothed, as was shewed, ¶ 3. Then with the proper *Gage*, viz. the Long, the Ascending, or else the Short *Face-Gage*, according as the Letter is that he intends to Cut, He measures off the exact Height of the Letter, Thus ; He first Files one of the Sides of the Face of the *Punch* (viz. that Side he intends to make the Foot of his Letter) exactly straight ; which to do, he screws his *Punch* pretty near the bottom end, with its intended Foot-side uppermost, aslope into one end of the Chaps of his *Hand-Vice*. So that the Shank of the *Punch* lies over the Chaps of the *Hand-Vice*, and makes an Angle of about 45 Degrees with the Superficies of the Chaps of it : Then he lays the under side of the Shank of his *Punch* aslope upon his *Tache*, in one of the Notches of it, that will best fit the size of his *Punch*, to keep it steady ; and so Files the Foot-Line of the *Punch*.

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But he Files not athwart the sides of his *Punch* ; for that might make the Foot-Line Roundish, by a Mounting and Dipping the Hand is prone to ; as I shewed , *Vol. I. Fol. 15, 16.* But he holds his File so as the Length of it may hang over the Length of the Shank of the *Punch*, and dip upon it at the Face of the *Punch*, with a Bevel, or Angle, of about 100 Degrees with the Face of the *Punch*. This Angle you may measure with the *Beard-Gage*, described in *Plate 10. Fig. C.* at *k*. Then Filing with the File in this Position, the Foot-Line will be made a true straight Line. But yet he examines it too by applying the *Liner* to it ; and holding the *Punch* and *Liner* thus to the Light ; If the *Liner* touches all the way on the Foot-Line, he concludes it true ; if not, he mends it till it do.

Then he uses his proper *Steel-Gage*, and places the Sholder of it against the Shank of the *Punch* at the Foot-Line ; and pressing the Sholder of the *Steel-Gage* close against the Foot-Line, he, with the Tooth of the *Gage* makes a Mark or Race on the side of the Face, opposite to the Foot-line : And that Mark or Race shall be from the Foot-Line, the Bounds of the Height of that Letter.

Then on the Face he draws or marks the exact shape of the Letter, with a Pen and Ink if the Letter be large, or with a smooth blunted Point of a Needle if it be small : Then with sizable and proper shaped and Pointed Sculptors and Gravers, digs or Sculps out the Steel between the Stroaks or Marks he made on the Face of the *Punch*, and leaves the Marks standing on the Face.

If

If the Letter be great he is thus to Sculp out, he then, with a Graver, Cuts along the Insides of the drawn or marked Stroaks, round about all the Hollow he is Cutting in. And having Cut about all the sides of that Hollow, he Cuts other straight Lines within that Hollow, close to one another (either parallel or aslope, it matters not) till he have filled the Hollow with straight Lines; and then again, Cuts in the same Hollow, athwart those straight Lines, till he fill the Hollow with Thwart Lines also. Which straight Lines, and the Cuttings athwart them, is only to break the Body of Steel that lies on the Face of the *Punch* where the Hollow must be; that so the Round-Back'd Sculptor may the easier Cut through the Body of the Steel, in the Hollow, on the Face of the *Punch*; even as I told you, *Numb.* 4. *Vol.* I. §. 2. the Fore-Plain makes way for the Fine Plains.

The *Letter-Cutter* does not expect to perform this Digging or Sculpting at one single Operation; but, having brought the Inside of his Letter as near as he can at the first Operation, he, with the flat side of a Well-worn, Small, Fine-Cut, Half-round File, Files off the Bur that his Sculptors or Gravers made on the Face of the Letter, that he may the better and nicelier discern how well he has begun. Then he again falls to work with his Sculptors and Gravers, mending, as well as he can, the faults he finds; and again Files off the Bur as before, and mends so off, till the Inside of his Letter pleases him pretty well. But before every Mending he Files off the Bur, which else, as aforesaid, would obscure and hide the true shape of his Stroaks.

Having well shaped the Inside Stroaks of his Letter, he deepens the Hollows that he made, as well as he can, with his Sculptors and Gravers: And the deeper he makes these Hollows, the better the Letter will prove. For if the Letters be not deep enough, in proportion to their Width, they will, when the Letter comes to be Printed on, Print Black, and so that Letter is spoiled.

How deep these Hollows are to be, cannot be well asserted, because their Widths are so different, both in the same Letter, and in several Letters: Therefore he deepens them according to his Judgment and Reason. For Example, O must be deeper than A need be, because the Hollow of O is wider than the Hollow of A; A having a Cross Stroak in it; and the wider the Hollow is, the more apt will the wet Paper be to press deeper towards the bottom in Printing. Yet this in General for the Depth of Hollows; You may make them, if you can, so deep as the *Counter-Punch* is directed to be struck into the Face of the Punch. See ¶. 3. of this §.

Having with his Gravers and Sculptors deepened them so much as he thinks convenient, he, with a *Steel Punch*, pretty near fit to the shape and size of the Hollow, and Flatted on its Face, Flattens down the Irregularities that the Gravers or Sculptors made, by striking with a proper Hammer, upon the Hammer-end of the *Punch*, with pretty light blows. But he takes great care, that this *Flat-Punch* be not at all too big for the Hollow it is to be struck into, lest it force the sides of the Stroaks of the Letter out of their shape: And therefore also it is, that he strikes

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but easily, though often, upon the end of the *Flat-Punch*.

Having finished the Inside, he works the Outfides with proper Files ; as I shewed before, in Letter A; and smoothenes and Pollishes the Outside Stroaks and Face with proper worn-out finall *Watch-makers* Files.

The Inside and Outside of the Face thus finished, he considers what Sholdering the Shank of the *Punch* makes now with the Face, round about the Letter. For, as the Shank of the Letter stands farther off the Face of any of the Stroaks, the Sholdering will be the greater when the Letter is first made ; because the Outfides of the Letter, being only shaped at first with Fine Small Files, which take but little Steel off, they are Cut Obtusely from the Shank to the Face, and the Steel of the Shank may with Rougher Files afterwards, be Cut down more Tapering to the Shank. For the Sholder of the Shank, as was said before in this ¶, must not make an Angle with the Face, of above 100 Degrees ; because else they would be, first, more difficult to Sink into Copper ; And Secondly, The broad Sholders would more or less (when the Letter is Cast in such Matrices) and comes to the Press, be subject, and very likely to be-smear the Stroaks of the Letter ; especially, with an Hard Pull, and too wet Paper ; which squeezes the Face of the Letter deep into the Paper, and so some part of the Broad Sholdering of the Letter, receiving the Ink, and pressing deep into the Paper, flurs the Printed Paper, and so makes the whole Work shew very nasty and un-beautiful.

For these Reasons it is, that the Shank of the *Punch*, about the Face, must be Filed away (at least, so much as is to be Sunk into Copper) pretty close to the Face of the Letter; yet not so as to make a Right Angle with the Face of the Letter, but an Obtuse Angle of about 100 Degrees: For, should the Shank be Filed away to a Right Angle, *viz.* a Square with the Face, if any Footing or Topping be on the Letter, these fine Stroaks will be more subject to break when the *Punch* is Sunk into Copper, than when the Angle of the Face and Shank is augmented; because then those fine Stroaks stand upon a stronger Foundation. Therefore he uses the *Beard-Gage*, and with that examines round about the Letter, and makes the Face and Shank comply with that.

Yet Swash-Letters, especially 2, whose Swashes come below the Foot-Line, and whose Length reaches under the Foot-Line of the next Letter, or Letters in Composing, ought to have the Upper Sholder of that Swash Sculped down straight, *viz.* to a Right Angle, or Square with the Face; at least, so much of it as is to be Sunk into Copper: Because the Upper Sholder of the Swash would else be so broad, that it would ride upon the Face of the next Letter. Therefore the Swash-Letters being all Long Letters, the lower end of the Swashes reach as low as the Bottom-Line; which cannot be Filed Square enough down from the Head-Line, unless the Steel the Swash stands on, should be Filed from end to end, the length of the whole Shank of the *Punch*, which would be very tedious; and besides, would
make

make that part of the Shank the Swash stands on so weak, that it would scarce endure Striking into the Copper. Therefore, as I said before, the Upper Sholder of the Swash ought to be Sculpted down: Yet I never heard of any *Letter-Cutters* that had the knack of doing it; but that they only Filed it as straight down as they could, and left the *Letter-Kerner*, after the Letter was Cast, to Kern away the Sholdering. Yet I use a very quick way of doing it; which is only by Resting the Back of a Graver at first, to make way; and afterwards a Sculptor, upon the Shank of the *Punch*, at the end of the Swash, one while; and another while on the Shank, at the Head, that the Swash may be Sculpted down from end to end: and Sculpting so, Sculp away great Flakes of the Steel at once, till I have Cut it down deep enough, and to a Right Angle.

Then he Hardens and Tempers the *Punch*; as was shewed, *Numb. 3. Vol. I. Fol. 57, 58.*

But though the *Punch* be Hardned and Temper'd, yet it is not quite finished: for, in the Hardning, the *Punch* has contracted a Scurf upon it; which Scurf must be taken off the Face, and so much of the sides of the Shank as is to be Sunk into Copper. Some *Letter-Cutters* take this Scurf off with small smooth Files, and afterwards with fine Powder of *Emerick*. The *Emerick* they use thus. They provide a Stick of Wood about two Handful long, and about a *Great-Primer*, or *Double-Pica* thick: Then in an Oyster-shell, or any sleight Concave thing, they powr a little Sallad-Oyl, and put Powder of *Emerick* to it, till it become of the Consistence of Batter made

made for Pan-cakes. And stirring this Oyl and *Emerick* together, spread or smear the aforesaid Stick with the Oyl and *Emerick*, and so rub hard upon the Face of the *Punch*, and also upon part of the the Shank, till they have taken the Scurf clean off.

Mr. *Walberger* of *Oxford* uses another way. He makes such an Instrument as is described in *Plate 10.* at *H*, which we will, for distinction sake, call the *Joynt-Flat-Gage*. This Instrument consists of two Cheeks about nine Inches long, as a *b*, and are fastened together at one end, as the Legs of a *Carpenter's* Joynt-Rule are in the Centre, as at *c*, but with a very strong Joynt; upon which Centre, or Joynt, the Legs move wider, or closer together, as occasion requires. Each Leg is about an Inch and a quarter broad, and an Inch and three quarters deep; viz. so deep as the Shank of the *Punch* is long. At the farther end of the Shank *b* (as at *d*) is let in an Iron Pin, with an Head at the farther end, and a square Shank, to reach almost through a square Hole in the Shank *b*, that it twists not about; and at the end of that Square, a round Pin, with a Male-Screw made on it, long enough to reach through the Shank *a*, and about two Inches longer, as at *e*; upon which Male-Screw is fitted a Nut with two Ears, which hath a Female-Screw in it, that draws and holds the Legs together, as occasion requires a bigger or less *Punch* to be held in a proper Hole. Through each of the adjoining Insides of the Legs are made, from the Upper to the Lower Side, six, seven, or eight Semi-Circular Holes (or more or less, according to discretion) exactly Perpendicular to

to the upper and under Sides of each Leg, marked *a a a a*, *b b b b*. Each of these Semicircular Holes is, when joyned to its Match, on the other Leg to make a Circular Hole ; and therefore must be made on each Leg, at an equal distance from the Centre. These Holes are not all of an equal Size, but different Sizes : Those towards the Centre smallest, *viz.* so small, that the *Punch* for the smallest Bodied Letters may be pinched fast in them ; and the biggest Holes big enough to contain, pinch and hold fast the *Punches* for the great Bodied Letters. The upper and under sides of this *Joynt-Flat-Gage* is Faced with an Iron Plate, about the thickness of an Half Crown, whose outer Superficies are both made exactly Flat and Smooth.

When he uses it, he chuses an Hole to fit the Size of the *Punch* ; and putting the Shank of the *Punch* into that Hole, Sinks it down so low, till the Face of the *Punch*, stands just Level, or rather, above the Face of the *Joynt-Flat-Gage* : Then with a piece of an Hone, wet in Water, rubs upon the Face of the *Punch*, till he have wrought off the Scurf. At last, with a Stick and Dry *Putty*, Polishes it.

I like my own way better than either of the former : For, to take off the Scurf with Small Files spoils the Files ; the Face of the *Punch* being Hard, and the Scurf yet Harder : And besides, endangers the wronging the Face of the *Punch*.

The *Joynt-Flat-Gage* is very troublesome to use, because it is difficult to fit the Face of the *Punch*, to lie in the Plain of the Face of the *Gage* ; especially, if, in making the Letter, the Shank be Filed Tapering,

ing, as it most times is. For then the Hammer-end of the *Punch* being bigger than the Face-end, it will indeed Pinch at the Hammer-end, whilst the Face-end stands unsteady to Work on. But when the *Punch* is fitted in, it is no way more advantageous for Use, than the Chaps of the *Hand-Vice* I mentioned in ¶. 3. of this §.

Wherefore, I fit the *Punch* into the Chaps of the *Hand-Vice*, as I shewed in the aforesaid ¶. and with a fine smooth Whet-stone and Water, take the Scurf lightly off the Face of the *Punch*; and afterwards, with a fine smooth Hone and Water, work down to the bare bright Steel. At last, drying the *Punch* and Chaps of the *Hand-Vice* with a dry Rag, I polish the Face of the *Punch* with Powder of Dry Brick and a Stick, as with Putty.

¶. 5. *Some Rules he considers in using the Gravers, Sculptors, Small Files, &c.*

1. When he is Graving on the Inside of the Stroak, either to make it Finer or Smoother, he takes an especial care that he place his Graver or Sculptor so, as that neither of its Edges may wrong another Stroak of the Letter, if they chance (as they often do) to slip over, or off an extuberant part of the Stroak he is Graving upon. And therefore, I say, he well considers how he is to manage the edges of his Graver. For there is no great danger of the point of his Graver after the inside Stroaks are form'd, and the Hollows of the Letter somewhat deepned; but in the edges there is: For the point
in

in working lies always below the Face of the Letter, and therefore can, at most, but slip below the Face, against the side of the next Stroak ; but the edges lying above the Face of the Letter, may, in a slip, touch upon the Side and Face of the next Stroak, and wrong that more or less, according as the force of the Slip was greater or smaller. And if that Stroak it jobs against were before wholly finished, by that job the whole Letter is in danger to be spoiled ; at the best, it cannot, without Filing the Letter lower, be wrought out ; which sometimes is a great part of doing the Letter anew : For he takes special care that neither any dawb, or the least extuberant bunching out be upon the inside of the Face of the Stroak, but that the inside of the Stroak (whether it be Fat or Lean) have its proper Shape and Proportion, and be purely smooth and clean all the way.

If on the inside of the Stroak the Graver or Sculptor have not run straight and smooth on the Stroak, but that an Extuberance lies on the Side, that Extuberance cannot easily be taken off, by beginning to Cut with the Edge of the Graver or Sculptor just where the Extuberance begins : Therefore he fixes the Point of his Graver or Sculptor in the Bottom of the Hollow, just under the Stroak where the Extuberance is, and leans the Edge of his Graver or Sculptor upwards ; so as in forcing the Point of the Graver or Sculptor forwards, at the Bottom of the Hollow, the Edge of the Graver or Sculptor may slide tenderly along, and take along with it a very small, nay, invisible Chip of the most Prominent Part of the Extuberance ; and so, by this Process reiterated

ted often, he, by small Degrees, Cuts away the Extuberant part of the Stroak.

2. He is careful to keep his Gravers and Sculptors always Sharp, by often Sharpening them on the Oyl-Stone, which for that purpose he keeps ready at hand, standing on the Bench : For if a Graver or Sculptor be not sharp, it will neither make riddance, or Cut smooth ; but instead of Cutting off a small Extuberancy, it will rather stick at it, and dig into the Side of the Stroak.

3. He Files very tenderly with the Small Files, especially with the Knife-Files, as well because they are Thin and Hard, not Temper'd, and therefore would snap to pieces with small violence ; as also, lest with an heavy hand he should take away too much at once of that Stroak he is working upon.

§. 14. ¶ 1. *Some Rules to be observed by the Letter-Cutter, in the Cutting Roman, Italick, and the Black English Letter.*

1. The Stem and other Fat Stroaks of Capital *Romans* is five Parts of forty and two (the whole Body :) Or, (which is all one) one sixth part of the Heighth of an Ascending Letter (as all Capitals are Ascendents) as has been said before. *Albertus Durer* took his Measure from the Heighth of Capitals, and assigned but one tenth part for the Stem.

2. The Stem, and other Fat Stroaks of Capitals *Italick*, is four parts of forty and two, (the Body.)

3. The Stem, and other Fat Stroaks of Lower-Case *Roman*, is three and an half parts of forty and two, (the Body.)

4. The

4. The Stem, and other Fat Stroaks of Lower-Case *Italick*, is three parts of forty and two, (the Body.)

5. Of *English*, the Short Letters stand between nine parts of the Bottom-Line, and nine parts from the Top-Line; *viz.* upon three and thirty parts of forty and two, (the Body.)

6. The Stem of *English* Capitals is six parts of forty and two, (the Body.)

7. The Stem of *English* Lower-Case Letters is four parts of forty and two, (the Body.)

¶ 2. Of Terms relating to the Face of Letters,
and their Explanation.

The Parts of a *Punch* are already described in §. 13. ¶ 1. of this Volumne; and so is the Body: But the several Terms that relate to the Face of Letters are not yet defined. Now therefore you must note, that the Body of a Letter hath four principal Lines passing through it (or at least imagined to pass through it) at Right Angles to the Body; *viz.* The Top-Line, The Head-Line, The Foot-Line, and The Bottom-Line.

Between two of these Lines is contained the Height of all Letters.

These are called *Lines*, because the Tops, the Heads, the Feet and the Bottoms of all Letters (when Complicated by the *Compositor*) stand ranging in these imagin'd Lines, according as the Height and Depth of each respective Letter properly requires.

The Long Letters are (as I told you in §. 13. ¶. 1. of this Volumn) contained between the Top and Bottom-Lines, The Ascending Letters are contained between the Top and Foot-Lines, The Descending Letters are contained between the Head and Bottom-Lines, and The Short Letters are contained between the Head and Foot-Lines.

Through what Parts of the Body all these Lines pass, you may see by the Drafts of Letters, and the following Descriptions.

What the Long Letters, Ascending Letters, and Short Letters are, I shewed in the afore-cited ¶. Therefore I shall now proceed to particular Terms relating to the Face. As,

1. The Topping, is the straight fine Stroak or Stroaks that lie in the Top-Line of Ascending Letters: In *Roman* Letters they pass at Right Angles through the Stems; but in *Italicks*, at Oblique Angles to the Stems; as you may see in the Drafts of Letters, B, B, H, H, I, I, &c.

2. The Footing, is the straight fine Stroak or Stroaks that lie in the Foot-Line of Letters, either Ascending or Descending. In *Romans* they pass at Right Angles through the Stem, but in *Italicks*, at Oblique Angles; as you may see in B, B, H, H, I, I, &c.

3. The Bottom-Footing, is the straight fine Stroaks that lie in the Bottom-Line of Descending Letters. In *Romans* they pass at Right Angles through the Stem; but in *Italicks* at Oblique Angles; as you may see p, p, q, q.

4. The

4. The Stem is the straight Fat Stroak of the Letter : as in B, *B*, the straight Stroak on the Left Hand is the Stem ; and I, *I*, is all Stem, except the Footing and Topping.

5. Fat-Stroaks. The Stem or broad Stroak in a Letter is called Fat ; as the Right Hand Stroak in A, and part of the great Arch in B, are Fat Stroaks.

6. Lean Stroaks, are the narrow fine Stroaks in a Letter ; as the Left Hand Stroak of A, and the Right Hand Stroak of V are Lean.

7. Beak of Letters, is the fine Stroak or Touch that stands on the Left Hand of the Stem, either in the Top-Line, as b d h, &c. or in the Head-Line, as i, m, n, &c. Yet f, g, l, *f*, *g*, *l*, have Beaks on the Right Hand of the Stem.

8. Tails of Letters, is a Stroak proceeding from the Right Hand Side of the Stem, in the Foot-Line ; as a d t u : and most *Italick* Lower-Case Letters have Tails : As also have most Swash Letters. But several of their Tails reach down to the Bottom-Line.

9. Swash Letters are *Italick* Capitals ; as you see in Plate 15.

Thus much of Letter-Cutting. The next Exercises shall (God willing) be upon *Making Matrices, Making Molds, Casting and Dressing of Letters, &c.*

F I N I S.

ADVERTISEMENT.

Numb. 4. of the Second Volume of Collections of Letters for Improvement of Husbandry and Trade, is now extant; being Enquiries relating to Husbandry and Trade: drawn up by the Learned Robert Plot, L. L. D. Keeper of the Ashmolean Musæum, and Professor of Chymistry in the University of Oxford, and Secretary of the Royal Society of London. An Account of the manner of making Brunswick-Mum. An Account of a great Improvement of Mossy Land, by Burning and Liming; from Mr. Adam Martindale of Cheshire.

To be had at the *Angel* in Cornhil, and several other Booksellers.

Plate 11.

A B C D E

A Scale of 42 Parts Vis. the Body.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32

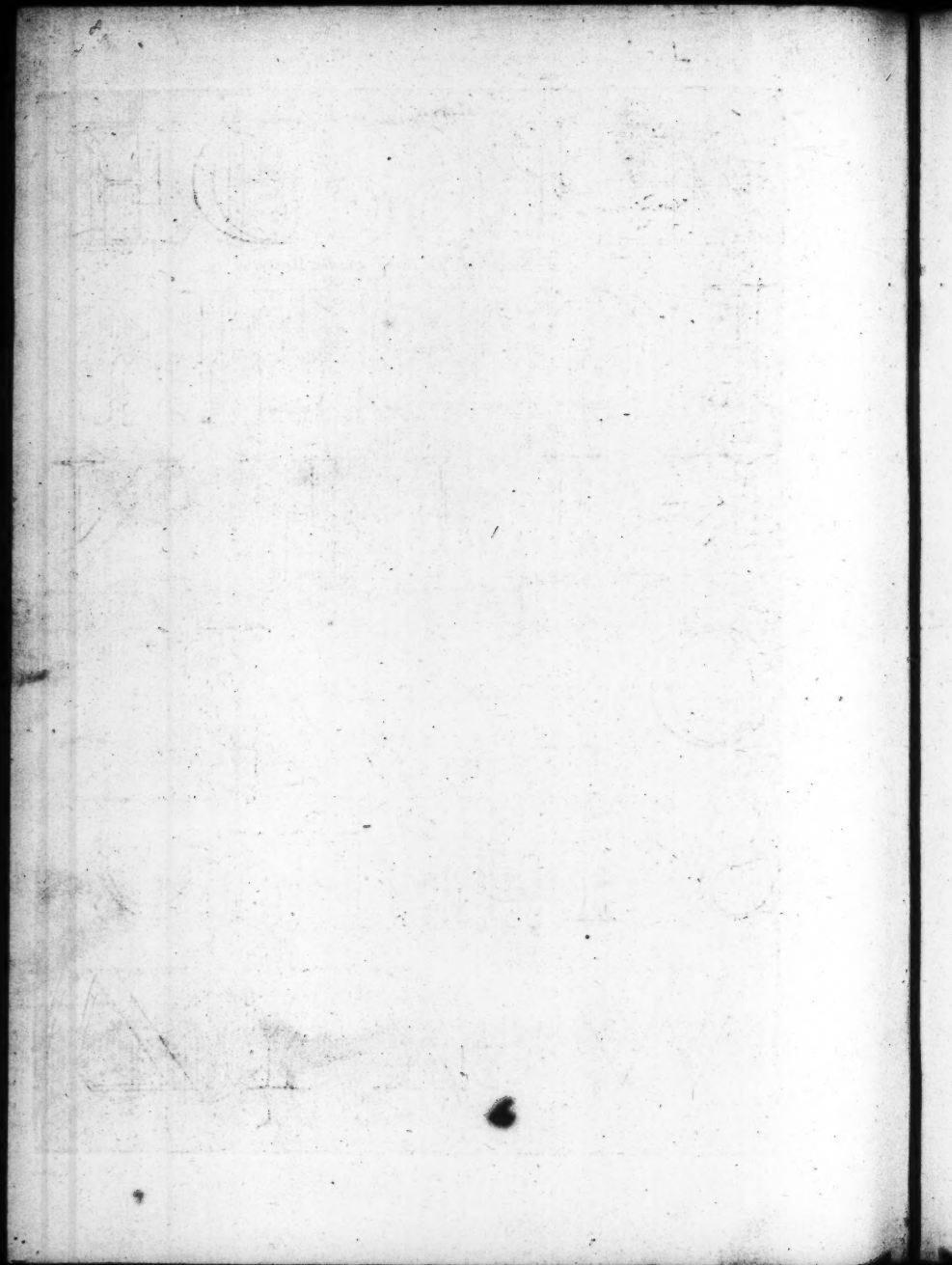
F G H I J

K L M N

O P Q R

S T V U

W X Y Z



A E a b c d e f

A Scale of 43 Parts viz the Body.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43

g h i j k l m n

o p q r s t v

u w x y z &

ç t f t f f h f f i æ œ

I 2 3 4 5 6 7 8 0

A B C D E

A Scale of 42 Parts viz. the Body.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42

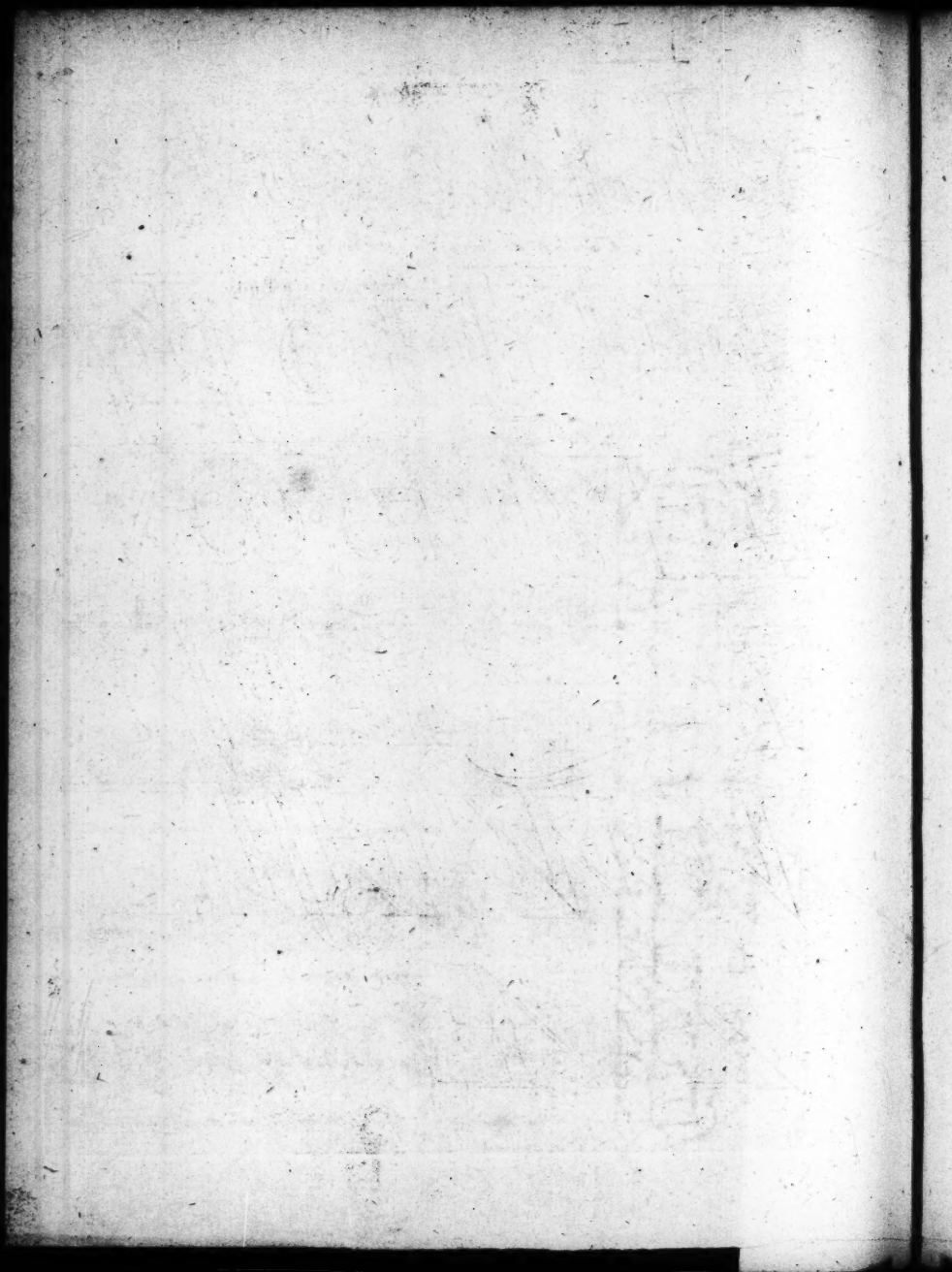
F G H I K

L M N O

P Q R S T

V W X Y

Z AE



a b c d e f g h i

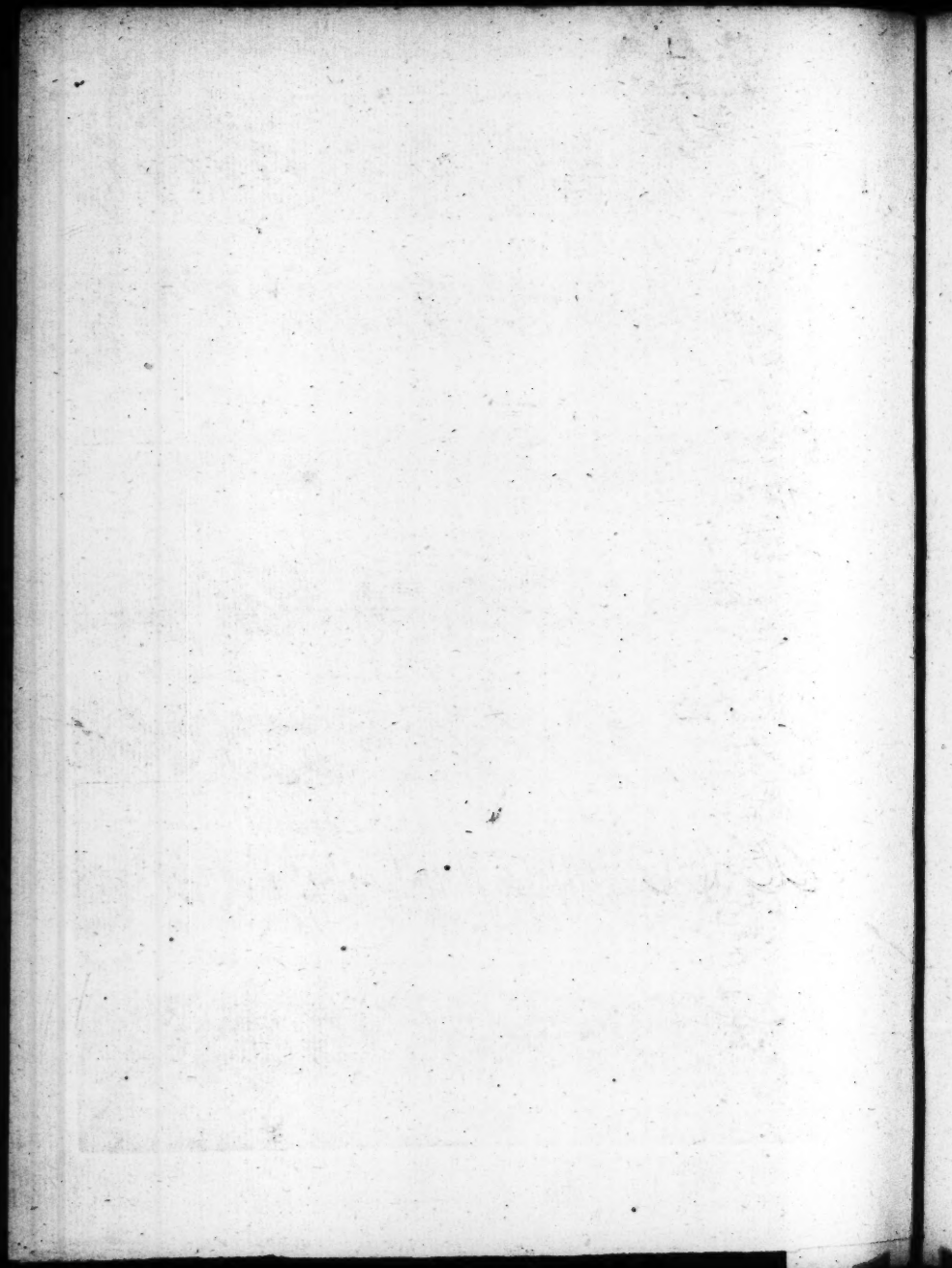
A Scale of 42 Parts Viz. the Body.

j k l m n o p q

r s t u v w x

y z & c t s t b

e æ s s i f f i f f l



A B C D E

A Scale of 42 Parts viz. $\frac{1}{2}$ Body.

6 12 18 24 30 36 42

F G H I K

M N P

Q R T

U X Y Z

A

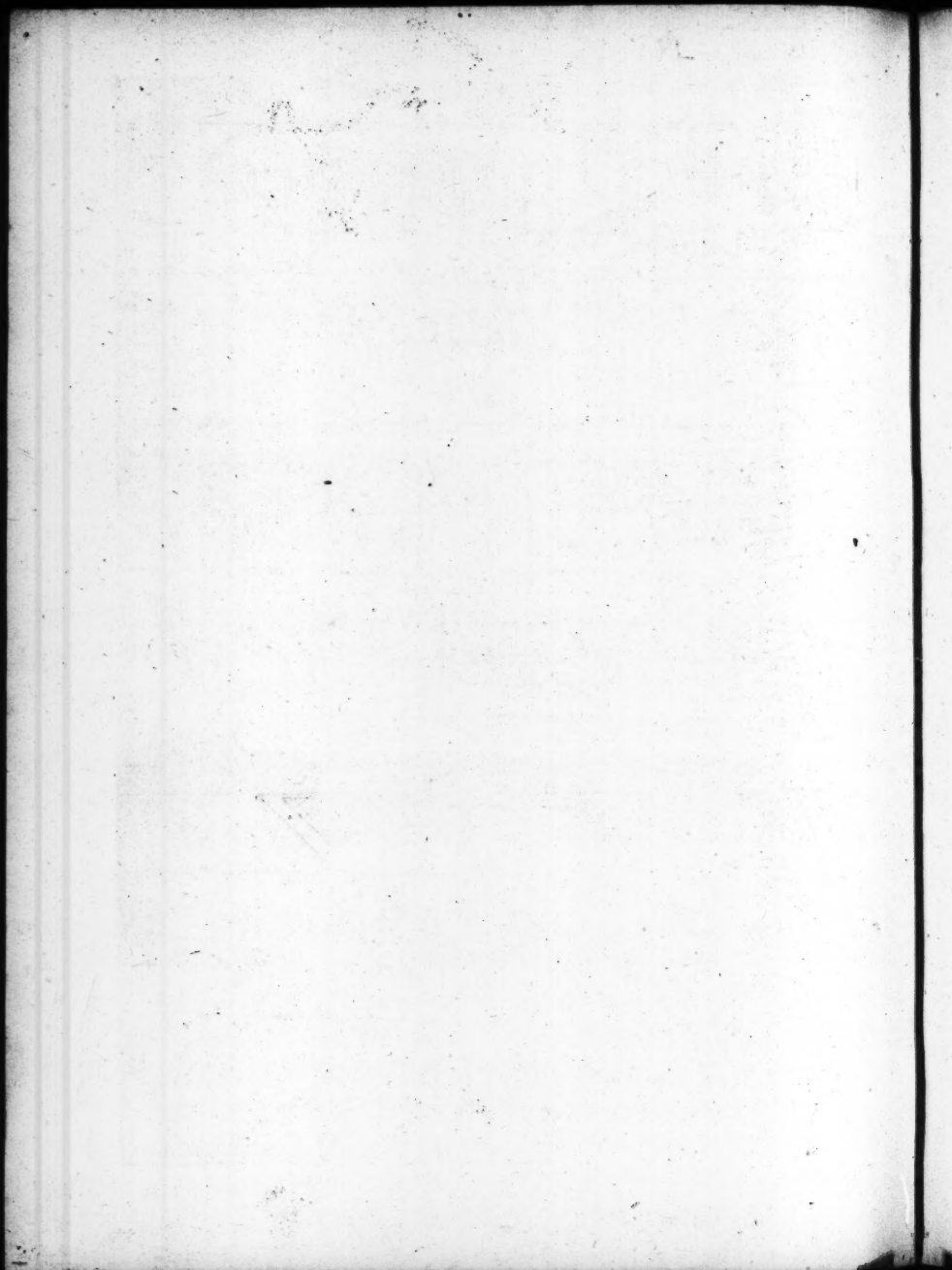
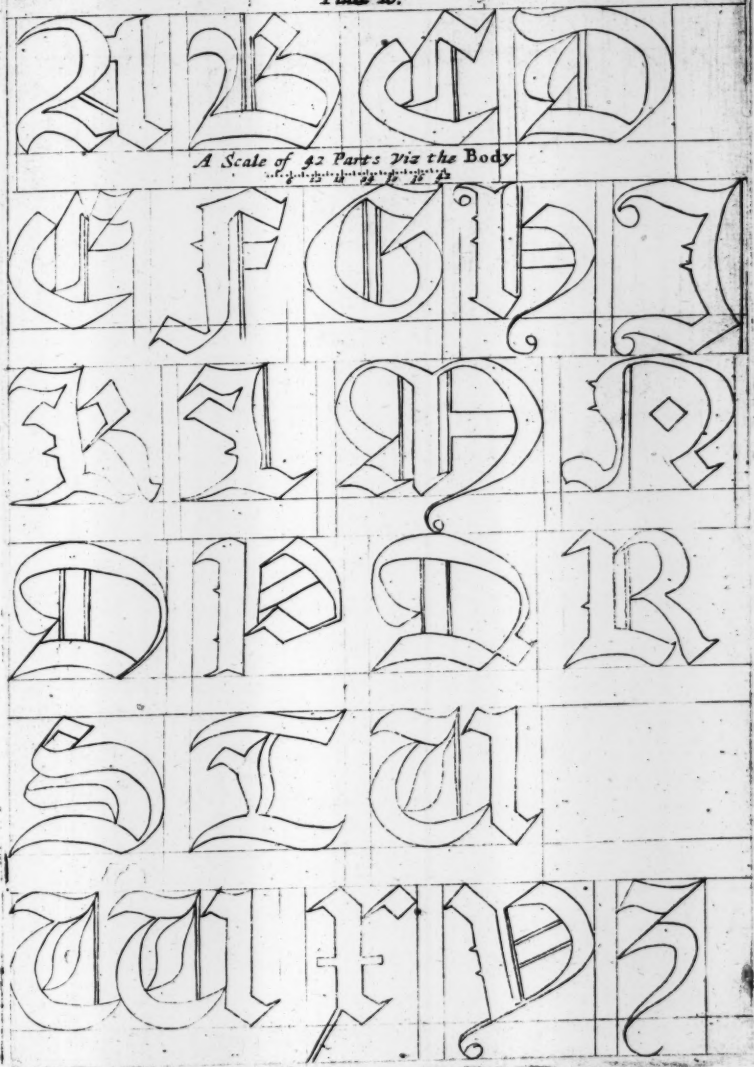
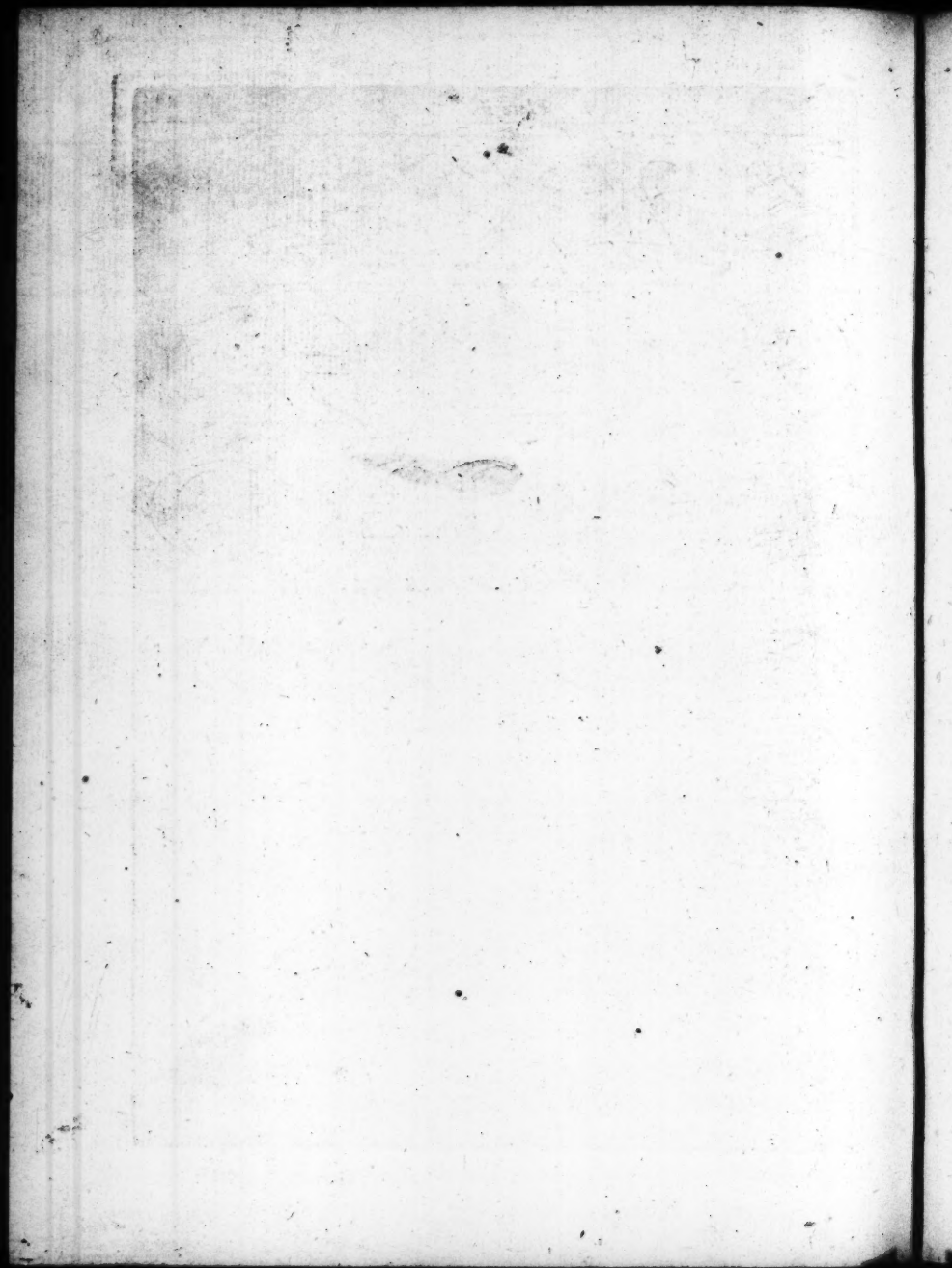
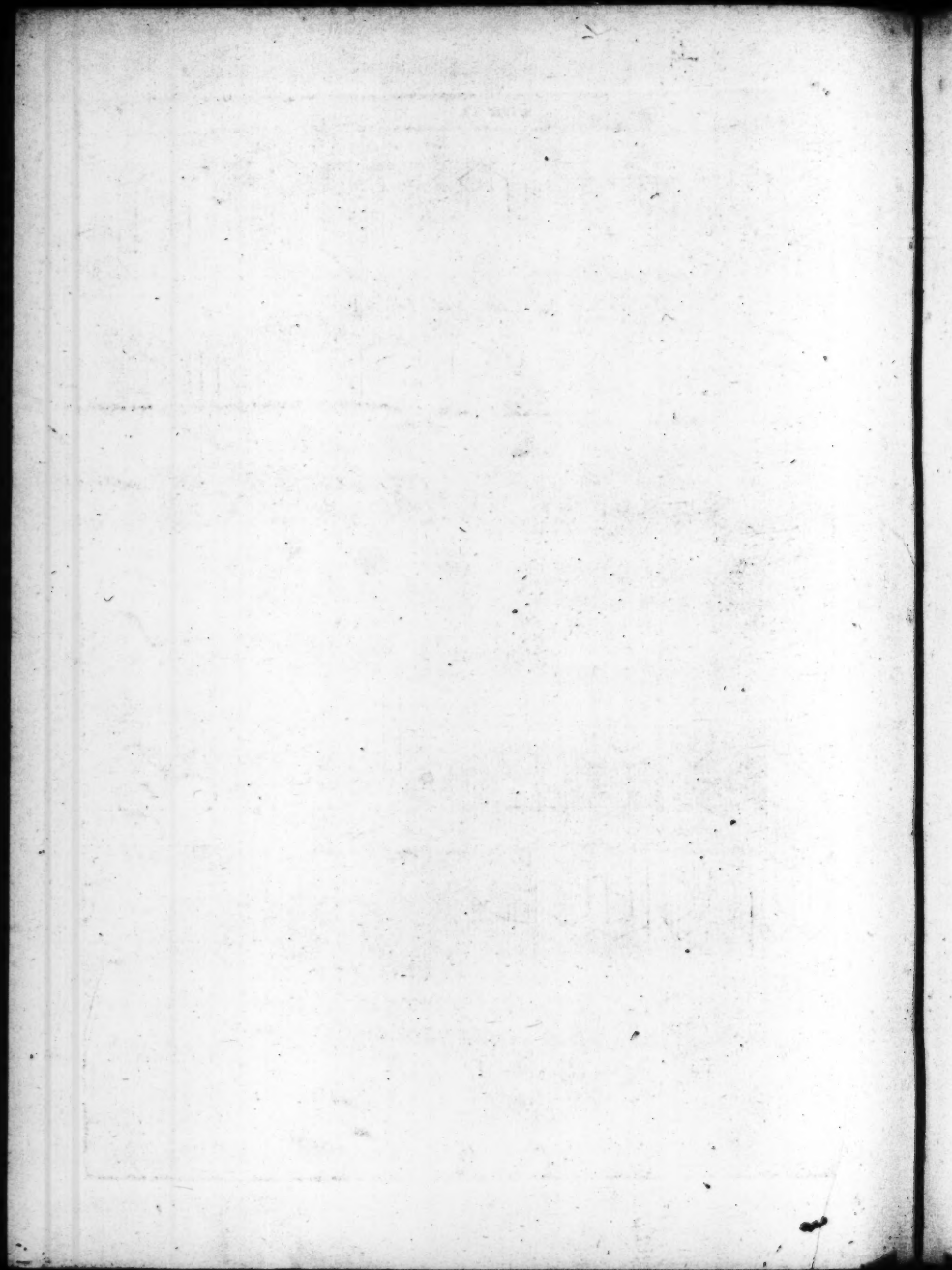


Plate 16.







MECHANICK EXERCISES:

Or the Doctrine of

Handy-works.

Applied to the A R T of

*Mold-Making, Sinking the Matrices,
Casting and Dressing of***Printing-Letters.**

The Second VOLUME.

§ 15. ¶ 1. *Of making the Mold.*

THE *Steel Punches* being thus finish'd, as afore was shewed, they are to be sunk or struck into pieces of *Copper*, about an Inch and an half long, and one quarter of an Inch deep; but the thickness not assignable, because of the different thicknesses in Letters, as was shewed in § 2. and shall further be shewed, when I come to the sinking and justifying

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stifying of *Matrices*. But before these *Punches* are sunk into *Copper*, the *Letter-Founder* must provide a *Mold* to justify the *Matrices* by: And therefore it is proper that I describe this *Mold* to you before I proceed any farther.

I have given you in Plate 18. at A, the Draft of one side or half of the *Mold*; and in Plate 19. at B, its Match, or other half, which I shall in general thus describe.

Every *Mold* is made of two parts, an under, and an upper Part; the under part is delineated at A, in Plate 18, the upper part is marked B, in Plate 19, and is in all respects made like the under part, excepting the *Stool* behind, and the *Bow*, or *Spring* also behind; and excepting a small roundish *Wyer* between the *Body* and *Carriage*, near the *Break*, where the under part hath a small rounding *Groove* made in the *Body*. This *Wyer*, or rather *Half-Wyer* in the upper part makes the *Nick* in the *Shank* of the *Letter*, when part of it is received into the *Grove* in the under part.

These two parts are so exactly fitted and gaged into one another, (*viz.* the *Male Gage*, marked C in Plate 19, into the *Female-Gage* marked g, in Plate 18.) that when the upper part of the *Mold* is properly placed on, and in the under part of the *Mold* both together, makes the entire *Mold*, and may be slid backwards for Use so far, till the Edge of either of the *Bodies* on the middle of either *Carriage* comes just to the Edge of the *Female-Gages*, cut in each *Carriage*: And they may be slid forwards so far, till the *Bodies* on either *Carriage* touch each other. And the sliding of these two parts of the *Mold* backwards, makes

makes the *Shank* of the Letter thicker, because the Bodies in each part stand wider asunder; and the sliding them forwards makes the *Shank* of the Letter thinner, because the Bodies on each part of the *Mold* stand closer together.

This is a general Description of the *Mold*; I come now to a more particular Description of its parts.

a The *Carriage*.

b The *Body*.

c The *Male-Gage*.

d e The *Mouth-Piece*.

f i The *Register*.

g The *Female-Gage*.

h The *Hag*.

a a a a The *Bottom Plate*.

b b b The *Wood* the *Bottom Plate* lies on.

c c e The *Mouth*.

d d The *Throat*.

e d d The *Pallat*.

f The *Nick*.

g g The *Stool*.

h h g The *Spring* or *Bow*.

I have here given you only the Names of the parts of the *Mold*, because at present I purpose no other Use of it, than what relates to the sinking the *Punches* into the *Matrices*: And when I come to the casting of Letters, You will find the Use and Necessity of all these Parts.

¶ 2. *Of the Bottom-Plate.*

The *Bottom Plate* is made of *Iron*, about two Inches and three quarters long, and about the same breadth; its thickness about a *Brevier*: It is planisht exactly flat and streight: It hath two of its *Fore-Angles*, as a *a* cut off either straight or rounding, according to the pleasure of the Work-man.

About the place where the middle of the *Carriage* lies, is made a Hole about a *Great Primmer* square, into which is rivetted on the upper side a Pin with a Sholder to it, which reaches about half an Inch through the under side of the *Bottom Plate*. This Pin on the under side the *Bottom Plate* is round, and hath a *Male-Screw* on its end. This Pin is let through a Hole made in the Wood of the *Mold* to fit it; so that when a square *Nut*, with a *Female-Screw* in it, is turned on the *Male-Screw*, it may draw and fasten the *Half Mold* firm to the Wood.

The Hind side of the *Carriage* lies on this *Bottom-Plate*, parallel to the Hind side of it, and about a *Two-Lin'd-English* within the Hind Edge of it; and so much of this *Bottom-Plate* as is between the *Register* and the left hand end of the *Carriage* (as it is posited in the Figure) is called the *Stool*, as *g g* in the under half of the *Mold*, because on it the lower end of the *Matrice* rests; but on the upper half of the *Mold* is made a square Notch behind in the *Bottom-Plate*, rather within than without the Edge of the *Carriage*, to reach from the *Register*, and half an Inch towards the left hand (as it is posited in the Figure)

that

that the upper part of the fore-side of the *Matrice* may stand close to the *Carriage* and *Body*.

¶ 3. *Of the Carriage.*

On the *Bottom-Plate* is fitted a *Carriage*, (as a) This *Carriage* is almost the length of the *Bottom-Plate*, and about a *Double Pica* thick, and its Breadth the length of the Shank of the Letter to be cast.

This *Carriage* is made of *Iron*, and hath its upper side, and its two narrow sides filed and rubed upon the using *File*, exactly straight, square and smooth, and the two opposite narrow sides exactly parallel to each other.

On one end of the *Carriage*, as at g, is made a long *Notch* or *Slit*, which I call the *Female-Gage*: It is about a *Double Pica* wide, and is made for the *Male-Gage* of the other part of the *Mold* to fit into, and to slide forwards or backwards as the thickness of the Letter to be cast may require.

¶ 4. *Of the Body.*

Upon the *Carriage* is fitted the *Body*, as at b. This *Body* is also made of *Iron*, and is half the length of the *Carriage*, and the exact breadth of the *Carriage*; but its thickness is alterable, and particularly made for every intended *Body*.

About the middle of this *Body* is made a square Hole, about a *Great Primmer*, or *Double Pica* square; and directly under it is made through the *Carriage* such another Hole exactly of the same size.

T 3

¶ 5. *Of*

¶ 5. Of the Male-Gage.

Through these two Holes, viz. That in the *Body*, and that in the *Carriage*, is fitted a square *Iron Shank* with a *Male-Screw* on one End, and on the other End an Head turning square from the square *Shanck* to the farther end of the *Body*, as is described at c; but is more particularly described apart at B in the same Plate, where B may be called the *Male-Gage*: For I know no distinct Name that *Founders* have for it, and do therefore coyn this:

a The square *Shanck*.

b The *Male-Screw*.

This square *Shanck* is just so long within half a *Sca-board* thick as to reach through the *Body*, *Carriage*, and another square Hole made through the *Bottom-Plate*, that so when a square *Nut* with a *Female-Screw* in it is turned on that *Pin*, the *Nut* shall draw and fasten the *Body* and *Carriage* down to the *Bottom-Plate*.

The Office of the *Male-Gage* is to fit into, and slide along the *Female-Gage*.

¶ 6. Of the Mouth-Piece.

Close to the *Carriage* and *Body* is fitted a *Mouth-Piece* marked d e. *Letter-Founders* call this altogether a *Mouth-Piece*: But that I may be the better understood in this present purpose, I must more nicely distinguish its parts, and take the Freedom to elect Terms for them, as first,

c c e The *Mouth*.

d The

d The *Palate*.

c c e d The *Jaws*.

d d The *Throat*.

Altogether (as aforesaid) the *Mouth-Piece*.

The *Mouth-Piece* hath its *Side* returning from the *Throat* filed and rubb'd on the *Using File* exactly straight and square to its *Bottom-side*, because it is to joyn close to the *Side* of the *Carriage* and *Body*; but its upper *Side*, viz. the *Palate* is not parallel to the *Bottom*, but from the *Side* d d, viz. the *Throat* falls away to the *Mouth* e, making an *Angle* greater or smaller, as the *Body* that the *Mold* is made for is bigger or less: For small *Bodies* require but a small *Mouth*, because small *Ladles* will hold Metal enough for small Letters; and the smaller the *Ladle*, the finer the *Geat* of the *Ladle* is; and fine *Geats* will easier hit the *Mouth* (in a Train of Work) than the coarse *Geats* of Great *Ladles*: Therefore it is that the *Mouth* must be made to such a convenient Width, that the *Ladle* to be used and its *Geat*, may readily, and without flabbering, receive the Metal thrown into the *Mold*.

But again, if the *Mouth-Piece* be made too wide, viz. the *Jaws* too deep at the *Mouth*, though the *Geat* of the *Ladle* does the readier find it, yet the *Body* of the *Break* of the *Letter* will be so great, that first it heats the *Mold* a great deal faster and hotter; and secondly, it empties the *Pan* a great deal sooner of its Metal, and subjects the Workman sometime to stand still while other Metal is melted and hot: Therefore Judgment is to be used in the width of the *Mouth*; and though there be no Rule for the width of it; yet this in general for such *Molds* as I make

make, I observe that the *Orifice* of the *Throat* may be about one quarter of the Body for small Bodies ; but for great Bodies less, according to Discretion, and the *Palate* about an Inch and a quarter long from the *Body* and *Carriage*. The reason that the *Orifice* of the *Throat* is so small, is, because the Substance at the end of the *Shanck* of the Letter ought also to be small, that the *Break* may easier break from the *Shanck* of the Letter, and the less subject the *Shanck* to bowing ; for the bowing of a Letter spoils it ; and the reason why the *Palate* is so long, is, that the *Break* being long, may be the easier finger'd and manag'd in the breaking.

If it be objected, that since the smalness of the *Break* at the end of the *Shanck* of the Letter is so approvable and necessary for the reason aforesaid, then why may not the *Break* be made much more smaller yet? The Answer will be, No ; because if it be much smaller than one quarter of the Body, Metal enough will not pass through the *Throat*, to fill both the *Face* and *Shanck* of the Letter, especially if the Letter to be cast prove thin.

Near the *Throat* and *Jaw* is made straight down through the *Palate* a square Hole (as at *k*.) This square Hole hath all its Sides on the *Upper-Plain* of the *Palate* opened to a *Bevel* of about 45 Degrees, and about the depth of a thick *Scaboard*. Into this square Hole is fitted a square *Pin* to reach through it ; and within half a *Scaboard* through a square Hole, made just under it in the *Bottom-Plate* which the *Mouth-Peice* lies upon. On the upper end of this square *Pin* is made a square *Sholder*, whose under sides are filed *Bevil* away, so as the

to comply and fall just into the *Bevil* made on the *Palate* aforesaid; and on the under end of the *Pin* is made a *Male-screw* long enough to contain a square *Nut*, with a *Female-screw* in it about a *Pica* or *English* thick, which *Nut* being twisted about the *Pin* of the *Male-screw*, draws and fastens the *Mouth-piece* close down to the *Bottom-Plate*, and also close to the *Carriage* and *Body* of the *Mold*.

Note, that the square *Hole* made in the *Bottom-Plate* to receive the square *Shanck* of the *Pin*, must be made a little wider than just to fit the square *Shanck* of the *Pin*, because the *Mouth-piece* must be so placed, that the end of the *Jaw* next the *Throat* must lie just even with the *Body* it is to be joyned to; and also that the *Throat* of the *Mouth-piece* may be thrust perfectly close to the *Sides* of the *Carriage* and *Body*: And when Occasion requires the *Shanck* of the *Letter* to be lengthened, it may be set farther off the *Carriage*, that an *Aside*, or sometimes a thin *Plate* of *Brass* may be fitted in between the *Carriage* and the *Throat* of the *Mouth-piece*, as shall farther be shewed when I come to justify the *Mold*.

¶ 7. Of the Register.

Behind the *Mold* is placed the *Register*, as at *f i b*, which I have also placed apart in the aforesaid *Plate*, as at *C*, that it may the more perspicuously be discerned, and a more particular account of its parts be given, which are as follows:

C a a b c d e The *Register*.

a a The *Shoulders*.

U

b c The

b c The Neck.

d The Cheek returning square from the Plate of the Register, and is about an English thick.

e The Screw Hole.

It is made of an Iron Plate about a Brevier thick; its upper Side is straight, but its under Side is not: For at *a a* projects downwards a small piece of the same Plate, which we may call the *Sholders*, of the Form you see in the Figure. These *Sholders* have two small *Notches* (as at *b c*) filed in them below the *Range* on the under side of the Register, which we will call the *Neck*, and is just so wide as the *Bottom-Plate* is thick. This *Neck* is set into a square *Notch*, filed so far into the *Bottom-Plate*, that the flat inside of the Register may stand close against the hind side of the Carriage and Body; and this *Notch* is filed so wide on the left Hand, that when the side *b* of the Neck stands close against the left-hand Side of this *Notch* (as it is posited in the Figure) the Cheek of the Register stands just even with the Edge of the Body. And this *Notch* is also filed so wide on the right-Hand Side, that when the Neck at *c* stands close against the right-hand Side of the *Notch*, the Cheek of the Register may remove an m, or an m and an n from the edge of the Body towards the right hand: And the *Sholders a a* are made so long, that when either Side of the Neck is thrust close against its corresponding side in the *Notch* of the *Bottom-Plate*, the upper Edge of the opposite *Sholder* shall hook or bear against the under side of the *Bottom-Plate*, and keep the whole Register steady, and directly upright to the Surface of the *Bottom-Plate*.

In

In the Plate of the *Register*, is made a long square Hole, as at *e*, just wide enough to receive the *Pin* of a *Male-screw*, with a *Sholder* to it, which is to fit into a *Female-screw*, made in the Edge of the *Carriage*, that when the *Male-screw* is turned about in the *Female-screw* in the *Carriage*, it shall draw the *Sholder* of the said *Male-screw* hard against the upper and under Sides of the square Hole in the Plate of the *Register*, close to the side of the *Carriage* and *Body*.

The reason why the Hole in the Plate of the *Register* is made so long, is that the *Cheek* of the *Register* may be slid forwards or backwards as occasion requires; as shall be shewn when I come to justifying the *Mold*.

¶ 8. Of the Nick.

In the upper half of the *Mold*, at about a *Pica* distance from the *Throat*, is fitted into the under side of the *Body* the *Nick*: It is made of a piece of *Wyer* filed flat a little more than half away. This *Nick* is bigger or less, as the *Body* the *Mold* is made for is bigger or less; but its length is about two *ms*. It is with round *Sculptors* let exactly into the under side of the *Body*.

In the under half of the *Mold*, is made at the same distance from the *Throat*, on the upper side of the *Body*, a round *Groove*, just fit to receive the *Nick* in the upper half.

¶ 9. Of the Bow or Spring.

This is a long piece of hard *Iron Wyer*, whose Diameter is about a *Brevier* thick, and hath one end fastned into the Wood of the under half of the *Mold*, as at *b*; but it is so fastned, that it may turn about in the Hole of the Wood it is put into: For the end of it being batter'd flat, a small Hole is drilled through it, into which small Hole the end of fine *Lute-string Wyer*, or somewhat bigger is put, and fastned by twisting about half an Inch of the end of the *Lute-string* to the rest of the *Lute-string*: For then a considerable Bundle of that *Wyer*, of about the Size of a Doublet Button, being wound behind the Hole, about the end of the *Spring*, will become a *Sholder* to it, and keep the end of the *Spring* from slipping through the Hole in the Wood: But this *Button* or *Sholder* must also be kept on by thrusting another piece of *Wyer* stiff into the Hole made on the end of the *Spring*, and crooking that *Wyer* into the Form of an S, that it slip not out of the Hole.

The manner how the *Spring* is bowed, you may see in the Figure: But just without the Wood is twisted upon another *Wyer* about an *Englisch* thick five or six turns of the *Wyer* of the *Spring*, to make the whole *Spring* bear the stronger at its point: For the Office of the *Spring* is with its Point at *g*, to thrust the *Matrice* close against the *Carriage* and *Body*.

¶ 10. *Of the Hooks, or Hags.*

These are *Iron Wyers* about a *Long Primmer* thick: Their Shape you may see in the Figure: They are so fastned into the Wood of the *Mold*, that they may not hinder the *Ladle* hitting the *Mouth*. Their Office is to pick and draw with their Points the *Break* and *Letter* out of the *Mold* when they may chance to stick.

¶ 11. *Of the Woods of the Mold.*

All the *Iron Work* aforesaid of the *Mold* is fitted and fastned on two Woods, viz. each half one, and each Wood about an Inch thick, and of the shape of each respective *Bottom-Plate*. The Wood hath all its Sides except the hind-side, about a *Pica* longer than the *Bottom-Plate*; but the hind-side lies even with the *Bottom-Plate*. The *Bottom-Plate*, as afore was said in ¶ 2. of this §. hath an *Iron Pin* on its under side, about half an Inch long, with a *Male-screw* on its end, which *Pin* being let fit into an Hole in the Wood does by a *Nut* with a *Female-screw* in it draw, all the *Iron Work* close and fast to the Wood.

But because the Wood is an Inch thick, and the *Pin* in the *Bottom-Plate* but half an Inch long, therefore the outer or under side of the Wood (as posited in the Figure) hath a wide round Hole made in it flat at the Bottom, to reach within an *English*, or a *Great Primmer* of the upper side of the Wood. This round Hole is wide enough to receive the *Nut* with the *Fe-*

male-screw in it; and the *Pin* being now long enough to receive the *Female-screw* at the wide *Hole*, the *Female-screw* may with *round nosed Pliers* be turned about the *Male-screw* on the *Pin* aforesaid, till it draw all the *Iron Work* close to the *Wood*.

The *Wood* behind on the upper half is cut away as the *Bottom-Plate* of that half is; and into the thickness of the *Wood*, close by the right and left-hand side of this *Notch* is a small square *Wyer-staple* driven, which we may call the *Matrice-Check*; for its Office is only to keep the *Shanck* of the *Matrice* from flying out of this *Notch* of the *Mold* when the *Caster* is at Work. And the *Nuts* and *Screws* of the *Carriage* and *Mouth-piece*, &c. that lie under the *Bottom-Plate*, are with small *Chissels* let into the upper side of the *Wood*, that the *Bottom-plates* may lie flat on it.

Sect. XVI. Of justifying the Mold.

ALthough the *Mold* be now made; nay, very well and Workman-like made, yet is it not imagin'd to be fit to go to work withal; as well because it will doubtless Rag (as *Founders* call it; for which Explanation see the Table) as because the *Body*, Thickness, Straightness, and length of the *Shanck* must be finish'd with such great Nicety, that without several Proofs and Tryings, it cannot be expected to be perfectly true.

Therefore before the sinking and justifying the *Matrices*, the *Mold* must first be *justified*: And first, he justifies the *Body*, which to do, he casts about twenty *Proofs* or *Letters*, as they are called, though it matters

matters not whether the *Shanks* have yet Letters on them or no. These *Proofs* he sets up in a *Composing-stick*, as is described in § 17. ¶ 2. Plate 19. at G, with all their *Nicks* towards the right Hand, and then sets up so many Letters of the same *Body*, (which for Distinction-sake we will call *Patterns*) that he will justify his *Body* too, upon the *Proofs*, with all their *Nicks* also to the right Hand, to try if they agree in length with the same Number of Letters that he uses for his *Pattern*; which if they do not, for very seldom they do, but by the Workman's fore-cast are generally somewhat too big in the *Body*, that there may be Substance left to justify the *Mold*, and clear it from *Ragging*. Therefore the *Proofs* may drive out somewhat, either half a Line (which in *Founders* and *Printers* Language is half a *Body*) or a whole Line. (more or less.)

He also tries if the two sides of the *Body* are parallel, viz. That the *Body* be no bigger at the *Head* than at the *Foot*; and that he tries by taking half the number of his *Proofs*, and turning the Heads of them lays them upon the other half of his *Proofs*, so that if then the *Heads* and *Feet* be exactly even upon each other, and that the Heads and Feet neither drive out, nor get in, (*Founders* and *Printers* Language, for which see the Table) the two sides of the *Body* are parallel; but if either the *Head* or *Foot* drives out, the two sides of the *Body* are not parallel, and must therefore be mended.

And as he has examin'd the Sides of the *Body* so also he examines the thickness of the Letter, and tries if the two Sides of the thickness be also parallel, which
to

to do, he sets up his *Prooves* in the *Composing-stick* with their *Nicks* upwards. Then taking half of the *Prooves*, he turns the *Heads* and lay the *Heads* upon the *Feet* of the other half of his *Prooves*, and if the *Heads* and *Feet* lies exactly upon each other and neither *drive-out* or *get-in* the two *Sides* of the thicknesses are parallel. But if either the *Head* or *Foot drive-out* the two *Sides* of the thicknesses are not parallel; and must therefore be mended.

Next, he considers whether the sides of the *Body* be straight, first by laying two Letters with their *Nicks* upwards upon one another, and holding them up in his Fingers, between his Eye and the Light, tries if he can see Light between them: For if the least Light appear between them, the *Carriage* is not straight. Then he lays the *Nicks* against one another, and holds them also against the Light, as before: Then he lays both the *Nicks* outward, and examines them that way, that he may find whether either or both of the *Carriages* are out of straight.

But we will suppose now the *Body* somewhat too big, and that it drives out at the *Head* or *Foot*; and that the thickness *drives-out* at the *Head* or *Foot* and that the *Sides* of the *Body* are not straight. These are Faults enough to take the *Mold* asunder: but yet if there were but one of these Faults it must be taken asunder for that; by unscrewing the *Male-Gage*, to take the *Body* off the *Carriage*, and the *Carriage* off the *Bottom-Plate*.

Having found where the Fault of one or both sides of the *Body* is, he lays the *Body* down upon the *Using File*; and if the Fault be extuberant, he rubs the
Extu-

Extuberancy down, by pressing his Finger or Fingers hard upon the opposite side of the Body, just over the extuberant part; and so rubbing the Body hard forwards on the *Using-File*, and drawing it lightly backwards, he rubs till he has wrought down the extuberancy, which he examines by applying the *Lyner* to that side of the Body, and holding it so up between his Eye and the Light, tries whether or not he *Lyner* ride upon the part that was extuberant; which if it do, the extuberancy is not sufficiently rub'd off, and the former Process must again begin and be continued till the extuberancy be rub'd off. And if the Body were too big, he by this Operation works it down: Because the extuberancy of the *Body* rid upon the *Carriage*, and bore it up.

And if the fault be a *Dawk*, or Hollow in the *Body*, then he Works the rest of that side of the *Body* down to the bottom of the *Dawk*, which by applying the *Lyner* (as afore) he tries, and this also lessens the *Body*.

If the *Body* drive-out at *Head* or *Foot*, he lays the weight of his Fingers heavy at that side or end of the *Body* which is too thick, and so rubs that down harder.

If the thickness of the Letter, drive-out at *Head*, or *Foot*, he Screws the *Body* into the *Vice*, and with a flat sharp *File*, files the *Side* down at the *Head*, or *Foot*. At the same time, if the *Shank* of the Letter be not Square, he mends that also, and smooth-files it very well.

X

Then

Then he puts the *Mold* together again : And melting, (or laying aside) his first *Proofs*, lest they should make him mistake, he again *Casts* about twenty New *Proofs*, and examines by them as before, how well he has mended the *Body*, and how near he has brought the *Body* to the size of the *Pattern* : For he does not expect to do it the *First*, *Second*, or *Seventh* time ; but mends on, on, on, by a little at a time, till at last it is so finisht.

If the *Body* prove too small, it is underlaid with a thick or a thin *Affidue* ; or sometimes a thin *Plate* of *Brass*.

Then he examines the *Mouth-piece*, and sees that the *Jaws* slide exactly true, upon every part of the *Pallat* without riding.

If the *Throat* of the *Mouth-piece* lie too low, as most commonly it is designed so to do ; Then a *Plate* of *Brass* of a proper thickness is laid under it to raise it higher.

He also Justifies the *Registers*, making their *Cheeks* truly Square. And Screwing them about an n from the Corner of the *Body*.

He tries that the *Male* and *Female-Gages* fit each other exactly, and lie directly straight along, and parallel to both the *Sides* of the *Carriage*.

All this thus performed he needs not (perhaps) take the *Mold* asunder again. But not having yet consider'd, or examin'd the length of the *Shanck* of the *Letter*, he now does ; and if it be somewhat too long (as we will suppose by forecast it is) then the *Body* and *Carriage* being Screwed together, and both the Halves fitted in their *Gages*, the Edges of the
Carri-

Carriage and *Body* are thus together rub'd upon the *Ufing-File*, till the *Carriage* be brought to an exact length.

Having thus (as he hopes) finisht the justifying of the *Mold*; and put it together, and Screwed it fast up, he puts the two Halves together, and then Rubs or Slides them hard against one another, to try if he can perceive any little part of the *Body* Ride upon the *Carriage*, or *Carriage* ride upon the *Body*: To know which of them it is that Rides, or is extuberant, he uses the *Liner*; applying it to both the Places, as well of the *Body* as the *Carriage*: where he sees they have Rub'd or bore upon one another: And which of them that is extuberant, the Edge of the *Liner* will shew, by Riding upon it: And that part he Files upon with a small flat and very fine *File*, by little and little, taking off the extuberancy, till the *Bodies* and *Carriages* lie exactly flat upon, and close to one another: Which if they do not, the *Mold* will be sure to *Rag*.

§. XVII. ¶ I. Of *Sinking the Punches into the Matrices*.

THat the *Matrice*, and all its parts may be the better understood, as I shall have Occasion to Name them, I have given you a *Draft* of the *Matrice* in Plate, 18 at E. and shall here explain its parts.

E The *Matrice*, wherein is Punched E, the *Face* of the *Letter*.

a The *Bottom* of the *Matrice*.

b The *Top* of the *Matrice*.

X 2

c The

c The *Right Side* of the *Matrice*.

d The *Left Side* of the *Matrice*.

f g The *Face* of the *Matrice*.

h i The *Leather Groove* of the *Matrice*.

In the *Back* or *Side* behind the *Matrice*, just behind *E* is filed in athwart the *Back*, from the right to the left *Side* a *Notch*, to settle and hold the point of the *Spring* or *Wyer* of the *Mold* in, that the *Matrice* fly or start not back when it is at Work.

As I told you (in §. 11. ¶ 1.) that the *Punches* are to be made of several *Thicknesses*, for reasons there shewed; and that therefore the *Letter-Cutter* makes *Wooden Patterns* for his several *Sizes* of *Thicknesses* as well as *Heights*; so now I am come to the *Sinking* of the *Punches* into the *Matrices*, I must tell you again that the *Letter-Cutter* or else the *Founder*, (either of which that *Sinks* them; for sometimes it is a Task Incumbent on each of them) considers the *Thicknesses* of all the *Punches* he has to *Sink*, though *Height* he need not consider in *Sinking* the *Matrices*: For the *Matrices*, by reason of their length in *Copper* upwards and downwards, have Substance enough and to spare, for the longest *Letters* to be *Sunk* into them: Therefore I say, he only considers the several *Thicknesses* of all the *Punches*, and makes *Wooden Patterns* for them, marking with a Pen and Inck the number of each size, on the *Pattern* as before he did for the *Steel Punches*: But the *Patterns* he made for the *Steel Punches* will be too Thin for the *Copper Matrices*: Because the *Steel Punches* by *Sinking* into the *Matrices*, stretch and force the *Sides* of the *Copper* out, and sometimes crack them for want of Substance

stance ; and at other times carry or force the Substance of the *Matrice* so low with their *Sholder* if the *Letter* be broad, that it creates a great Trouble to rub them *Flat*, (as it is called) because it is done upon the *Using-File*.

Therefore he makes *Wooden Patterns* for every of the former siz'd *Punches*, so thick or rather an n thicker at the least, then he made the *Wooden Patterns*, that the *Steel-Punches* were made to be *Forged* by, that there may be Substance enough on each-side the *Copper* to bear the dilating that the sinking of the *Punch* into it will make, because the *Counter-Puncht-Letters* are Thicker by their *Stems* and *Footing* or *Topping* than the *Counter-Punches* made for them need be.

Therefore (as before) for three sizes of *Punches* to be *Counter-Puncht*, he made three several siz'd *Patterns* ; so now for the several siz'd *Punches* that are to be *Sunk* into *Matrices*, he makes three several siz'd *Patterns* of *Wood* for the *Copper-Smith* to draw out *Rods* of *Copper* of those several Sizes by, and each of them (as aforesaid) an n, and for the *Thick Letters* an m (at least) Thicker than the *Patterns* were made, for the *Steel-Punches* to be *Forged* to a size by.

In the *Forging* of these *Copper Rods*, he instructs the *Copper-Smith* to make Choice of the softest *Copper* he can get, that the *Steel-Punches* may run the less hazzard of breaking ; and sometimes (if too soft *Temper'd*) battering their *Stroaks*.

The *Rose Copper* is commonly accounted the softest:

But yet I have many times *Sunk Punches* indifferently into every sort of *Copper*. Nay, even cast *Copper*, which is generally accounted the Hardest: Because *Copper*, as well (as some other Mettals) Hardens with Melting.

These *Rods of Copper* are (as I told you in §. III. ¶ 1. to be Cut into small Lengths, each about an Inch and an half long, and a *Great-Primemr* or *Double-Pica* deep; and for great Bodied *Letters* a *Two-lin'd-English* deep; But their Thickness not assignable, because of the Different Thicknesses in *Letters*, both of the same and other *Bodies*, as in part I shewed, in §. II. and more fully in this present §. and ¶.

The reason why the *Copper-Rods* are Forged so deep, is, That the more substance of *Copper* may lie under the *Face* of the *Punch*: For if the *Rod* have not a convenient depth, the *Face* of the *Punch* in *sinking*, does the sooner ingage with the Hardness of the *Face* of the *Stake* it is *Sunk* upon: And having with a few Blows of the *Hammer*, soon hardned the *Copper* just under the *Face* of the *Punch*, as well the hardness of the small (thus hardned) *Body* of *Copper* just under the *Face* of the *Punch*, as the Hardness of the *Face* of the *Stake* contribute a complicated assistance to the breaking or battering the *Face* of the *Punch*. But if the *Rod* be deep, the Substance of *Copper* between the *Face* of the *Punch* and the *Stake* is less hardned, and consequently the *Punch* will *Sink* the easier, and deeper with less Violence.

But

But sometimes it has happ'ned that for the *Sinking* one *Matrice* or two, I have been loath to trouble my self to go to the *Copper-Smiths*, to get one *Forg'd*: and therefore I have made shift with such *Copper* as I have had by me. But when it has not been so deep as I could have wish't it, I have just entered the *Punch* into the *Matrice* upon the *Stake*, and to *Sink* it deep enough, I have laid it upon a good thick piece of *Lead*, which by reason of its softness has not hardned the *Copper* just under the *Face* of the *Punch*; but suffered the *Punch* to do its *Office* with good Success.

Having cut the *Copper-Rods*, into fit Lengths with a Cold *Chissel*, He files the end that is to stand upon the *Stool* of the *Mold* exactly square, and the Right-side of the *Matrice*, that stands against the *Carriage* and *Body*, also exactly Square and smooth upon the *Using-File*. Then he places the filed end, or *Bottom* upon the *Stool*, with the *Face* of the *Matrice* towards the *Carriage* and *Body*, and the Right side of the *Matrice*, close against the *Register*: Then if the *Punch* to be sunck be an ascending Letter. He with a fine pointed *Needle*, makes a small Race by the upper side of the *Carriage* upon the *Face* of the *Matrice*, and that Race is a mark for him, to set the top of the Ascending Letter at, when he *Sinks* it into the *Matrice*: So that then placing the *Punch* upright upon the middle of the Thickness of the *Matrice*, the *Matrice* lying solid on the *Stake*: He with the *Face* of an *Hammer* sizable to the bigness of his *Punch*, cautiously knocks upon the *Hammer-end* of the *Punch*, with reiterated Blows, till he

he have driven the *Punch* deep enough into the *Matrice*.

But if it be a short *Letter*, or a *Descending Letter*, and not *Ascending* also: Then he elects any *Cast-Letter* of the Thickness of the *Beard*, (as *Founnders* and *Printers* call it) For which Explanation see the Table, and he lays that *Letter* upon the *Surface* of the *Carriage*, and then placing the *Bottom* of the *Matrice* to be *Sunk* as before, on the *Stool*, and against the *Register*, He draws with a *Needle* as before, a race above the *Surface* of that *Letter*, against the *Face* of the *Matrice*, and that race is a Mark for him to place the *Head* of the *Letter* by. Then managing the *Punch* and *Hammer* as before was shewed, he *Sinks* the *Punch* into the *Matrice*.

But here arises a Question, viz. How deep the *Punches* are to be *Sunk* into the *Matrices*? The Answer is, a Thick *Space* deep, though deeper even to an *n* would be yet better: Because the deeper the *Punches* are *Sunk*, the lower does the *Beards* stand below the *Face*, and those *Beards* when the *Cast Letter* comes into the *Printers* Hands to be used, are the less subject to *Print*, as too oft they do both at *Head* or *Foot* of a *Page*, than when they lie so high that the softness of the *Blankets*, and Hardness of a *Pull*, or else carelessness of Running the *Carriage* of the *Press* to a considered Mark they would be. But they are seldom *Sunk* any deeper than a thick *Space*: and the reason is, because the breaking or battering the *Face* of the *Punch* should not be to much hazarded.

The

The many *Punches* to be *Sunk* into *Matrices* for the same *Body*, are difficult to be *Sunk* of an equal depth. Therefore I always make a *Beard-Gage*, as is described in *Plate 19* at *F*, where *a b* is a *Sholder* that rests upon the *Face* of the *Matrice*, *c* is the *Point* or *Gage* that measures the depth of the *Sunken Punch*. So that when the *Point c* just touches the *Bottom*, and both the *Sholders a b* the *Face* of the *Matrice*, the *Punch* may be accounted well *Sunk* as to depth.

But though it be accounted well *Sunk* for a first Essay, yet can it not be reasonably imagined it is well *Sunk* for good and all; as well because in *Sinking* the *Punches* it has carryed some part of the *Surface* of the *Matrice* down below the *Face* of the *Matrice* into the *Body* of the *Copper*, as because both the *Sides* are doubtless extorted, and one *Side* or *Part* of the *Punch* *Sunk* more or less deeper than the other. Wherefore I now come to

¶ 2. *Justifying the Matrices.*

Justifying of *Matrices* is, 1. to make the *Face* of the *Sunken* Letter, lie an exact designed depth below the *Face* of the *Matrice*, and on all its sides equally deep from the *Face* of the *Matrice*. 2. It is to set or *Justifie* the *Foot-line* of the Letter exactly in *Line*. 3. It is to *Justifie* both the sides, viz. the *Right* and *left-sides* of a *Matrice* to an exact thickness.

Therefore to proceed Methodically, he first slightly Files down the *Bunchings* out that the *Punch*
Y
made

made in the Sides of the *Matrice* ; And then slightly Files down all the *Copper*, on the *Face* of the *Matrice*, till the Hollow the *Punch* made becomes even with the whole *Face* of the *Matrice*.

Then he *Cast*s a *Proof-Letter* or two, and *Rubs* them : And with the Edge of a Knife cuts out what may remain in the bottom of the *Shanck* by reason of the un-even breaking, off of the *Break* that the square bottom of the *Shanck* may not be born off the *Bottom-Ledge* of the *Lining-Stick*.

But having till now said nothing of the *Lining-Stick*, it is proper before I proceed, to give a Description of it : It is delineated in *Plate 19* at *G*. Where *G* is the *Plain*, *a* the *Side-Ledge*, *b* the *Bottom-Ledge*, *c* the *Stilt*, all made of *Brass*.

The *Plain* is exactly Flat, Straight, and Smooth, that the *Shancks* of the *Letter* being likewise so, may lie flat and solidly on it. Its depth between the *Bottom-Ledge*, and the fore edge is about the length of the *Shanck* of the *Letter* : But the whole *Plain* of *Brass* is yet deeper ; Because the *Bottom-Ledge* is fastened on it. The *Lining-Stick* is about two *Inches* long for small *Letters* ; but longer for *Big-Bodied Letters*.

Both *Bottom* and *Side-Ledge*, is a thin piece of *Brass*, from a *Scaboard* to a *Pica* thick, according as the *Body* whose *Face* and *Foot-line* is to be *Justified* in it is bigger or less. These two *Ledges* is an *Inside Square* exactly wrought, and with small *Rivets* fastened on the *Side* edge, and on the *Bottom* edge.

The

The *Stilt* is a thin flat piece of *Brass-Plate* about a *Scaboard* thick, and a *Double-Pica* broad: One of its edges is *Soldered* to the under-side of the *Plain*, about a *Double-Pica* within the fore-edge of the *Plain*, that the *Lining-Stick* (when set by with *Proof-Letters* in it) may not lie flat on its *Bottom*; but have its fore edge *Tilted* up, that the *Letters* in it may rest against the *Bottom-Ledge*.

Having cut the *Notch* in the *Break* of the *Letters* as aforesaid, He *Rubs* every side of them on the *Stone*, with two or three hard *Rubs*, to take off the small *Rags* that may happen on the *Shanck* of the *Letter*, notwithstanding the *Mold* is imagined to be very truly made and *Justified*.

The *Stone* is commonly a whole *Grind-Stone*, about eighteen Inches diameter, having both its sides truly *Rub'd* flat and smooth, by *Jostling* it (as *Masons* call it) upon another broad long and flat *Stone* with *Sand* and *Water*. It must have a fine, but very sharp *Greet*. Now to return.

He places a *Quadrat* of the same *Body*, on the *Plain* of the *Lining-stick*, and against the *Side-Ledge* of it. He sets up three or four old *m's* of the same *Body*: Then sets up his *Proof-Letter* or *Letters*, and after his *Proof-Letter* three or four old *m's* more of the same *Body*; and being very careful that the *Foot* of the *Shanck* of the *Letter* stands full down against the *Bottom-Ledge* of the *Lining-stick*, He applies the edge of the *Liner* to the *Faces* of all these *Letters*: And if he finds that the edge of the *Liner* just touch (and no more) as well all the parts of his *Proof-Let-*

ters as they do upon his old *Letters*, He concludes his *Matrice* is *Sunk* to a true *Height against Paper*.

But he seldom hopes for so good luck; but does more likely expect the *Matrice* is *Sunk* too deep or too shallow, and awry on the right and left-side, or on the top or bottom of the *Line*, for all or any of these Faults the *Liner* will easily discover. Therefore I shall shew you how he *Justifies* a *Matrice* that is too *High against Paper*.

We will suppose the *Face* of the *Punch* is *Sunk* flat and straight down into the *Matrice*; but yet it is a little too deep *Sunk*. Therefore he considers how much it is too deep: If it be but a little too deep, perhaps when the *Face* of the *Matrice* shall be made exactly flat (for yet it is but *Rough-Filed*) it may be wrought down to be just of an *Height against Paper*. But if the *Punch* be *Sunk* so much too deep that the smoothing the flat of the *Face* on the *Using-File* will not work it low enough; then with a *Bastard-cut flat-File*, he takes off (according to his Discretion) so much *Copper* from the *Face* of the *Matrice* as will make it so much nearer as he thinks it wants to the *Face* of the *Letter*. But yet considers that the *Face* of the *Matrice* is yet to smoothen on the *Using-File*, and therefore he is careful not to take too much off the *Face* of the *Matrice* with the *Rough-File*.

He is also very careful that when he is to *File* upon the *Face* of the *Matrice*, to *Screw* the *Face* of it Horizontally flat in the *Vice*: And that in *Filing* upon it, he keeps his *File* directly Horizontal, as
was

was shewed, *Numb. 1. Fol. 15, 16. Vol. 1.* For if he let his right or left-Hand dip, the *File* will in its Natural Progress take too much off the side it dips upon, and consequently the *Face* of the Letter on that side will lie shallower from the *Face* of the *Matrice* then it will on the opposite side. The like caution he makes, in *Filing* between the *Top* and *Bottom* of the *Matrice* on the *Face*. For if he *Files* away too much *Copper* toward the *Top* or *Bottom*, the *Face* of the Letter on its *Top* or *Bottom-Line*, will lie on that end shallower from the *Face* of the *Matrice*.

Then he considers by his *Proof-Letters* how much too thick the right or left side of the *Matrice* is.

I told you in § 11. ¶ 4. that the Angle the *Sholder* made with the *Face* of the Letter, is about 100 Degrees, which is 10 Degrees more then a right Angle or Square. So that if a Letter be Cast and Rub'd just so thick that the *Liner* when applied to the *Shanck* of the Letter reaches just to the *Sholder*, there will be an Angle of 10 Degrees, contained between the edge of the *Liner* and the *Straight Line* that proceeds from the *Sholder* at the *Shanck*, to the outer-edge of the *Face* of the Letter. And if two Letters be thus Cast and Rub'd and Set together, the Angle contained between their *Shancks*, and the outer-edge of the *Face* of the Letter will be 20 Degrees, which is too wide by half for the *Faces* of two Letters to stand assunder. Therefore the sides of the *Matrice* must be so Justified, that when the *Shancks* of two Letters stand close together, the Angle be-

tween both the *Shanks*, and the adjacent outer-edges of the *Faces* of the *Letters* may both make an *Angle* of about 10 Degrees as aforesaid, which is a convenient distance for two *Letters* to stand assunder at the *Face*. But to do which, If the right-side be too thick, the *Register* of the under-half of the *Mold*, being (as I said) hard screw'd, so as to stand about an n off the edge of the *Body* towards the right hand; He places the *Foot* of the *Matrice* on the *Stool*, and the right-side of the *Matrice* close against the *Register*, and observes how much too thick that side of the *Matrice* is: For so much as the right-hand edge of the *Orifice* of the *Matrice* stands on the left hand side of the *Body*, so much is the right side of the *Matrice* too thick, and must by several offers be *Filed* away with a *Bastard-Cut-File*, not all at once, least (ere he be aware) he makes that side of the *Matrice* too thin, which will be a great damage to the *Matrice*, and cannot be mended but with a *Botch*, as shall in proper place be shewed.

Having by several proffers wrought the right-side of the *Matrice* thus near its thickness, he proceeds to *Justifie* the left-side also. But this side must be *Justified* by the upper half of the *Mold*; By turning the top of the *Matrice* downwards, and placing the left-side of it (now the right-side) against the *Register*, and works away the left-side in all respects as he did the right-side; still being very cautious he takes not too much *Copper* away at once.

To *Justifie* the *Letter* in *Line* he examines the *Proof-Letter* (yet standing in the *Lining-Stick*) and applies the

the *Liner* to the *Foot-line* : And if the *Liner* touch all the way upon the *Foot-line* of the *Proof-Letter* and the *Foot-Line* of all the old m's, that *Matrice* is *Justified in Line*. But this also very rarely happens at first, for by design it is generally made to stand too low in *Line* : Because the *Bottom* of the *Matrice* may by several proffers be *Filed* away till the *Letter* stand exactly in *Line*. But should he take too much off the *Bottom* of the *Matrice*, it cannot be made to stand lower without another *Botch*.

Nor does he reckon that this first Operation, or perhaps several more such, shall *Justifie* the *Matrice* in *Line*. But after bringing both the sides of the *Matrice* thus near, and also bringing the *Matrice* thus near in *Line*. He *Cast*s another *Proof-Letter* or two, and *Rubbing* all the sides of their *Shancks*, as before was shew'd, he tries by *Rubbing* the *Letters* how near he has brought the thickness of both the sides : For when the sides of the *Matrice* are brought just to such a thickness, that the *Shanck* of the *Letter* (*Cast* in the *Mold*) *Rubs* flat half way up beyond the *Beard* towards the *Face* of the *Letter*, the *Matrice* is of a convenient thickness, and there the *Angle* from the *Beard* of the *Shanck*, to the outer-edge of two *Letters* set together, will make an *Angle* of about 10 degrees as aforesaid, which being about one third part of a *thin-Space* is a convenient distance for the adjacent edges of two *Letters* to stand assunder : But yet *Founders* sometimes to *Get in* or *Drive out*, *Cast* the *Letters* thinner or thicker, and consequently their *Faces* stand closer or wider assunder

der, which is unseemly when the *Letter* comes to be Printed.

Then he sets the *Proof-Letters* in the *Lining-Stick*, between four or five old m's as before, and with the *Liner* examines again how well these *Proof-Letters* stand in *Line* with the old m's, which if they do not, he Reiterates the former Operations so oft, till the sides and *Line* of the *Matrice* is *Justified*, and at every Operation *Casts* new *Proof-Letters* to examine the thickness of both the Sides, and how well the *Matrice* is *Justified* to *Stand in Line*.

The *Matrice* being now *Justified*, he *Files* a *Leather-Groove* round about it, viz a *Notch* (made properest with a three square *File*) within about a thick *Scaboard* of the top of the *Matrice*, to tie the *Leather* fast to.

He also *Files* another *Notch* in the back-side of the *Matrice* athwart it, to rest the point of the *Wyer* or *Spring* in. But this *Notch* must by no means be made before the *Matrice* be *Justified* to its true *Height* against *Paper*: Because when this *Notch* is made, the *Punch* cannot again be struck in the *Matrice*; For that the *Matrice* will not lie solid on the *Stake* in that place.

¶ 3. Of Botching-Matrices, to make them serve the better.

Matrices are sometimes either through a careless, or sometimes through an unlucky stroak or two of the *File* made too thin. And sometimes the *Foot* of the *Matrice* is too much taken away, and the *Letter* by that

that means stands too high in *Line* : And sometimes the *Face* of the *Matrices* is too much taken away; So that the Letter will not stand *High enough against Paper*.

To remedy all or any part of these inconveniences, *Founders* are forced to make *Botches* on the *Matrice*: As first, If the *Matrice* be too thin on the right or left side, or both; They prick up that side, by laying the *Matrice* flat on the *Work-Bench*, with the thin side upwards, and holding the point of a *Punch-Graver* aslope upon the thin side, with an *Hammer* drive the point into the thin side of the *Matrice*, and so raise a *Bur* upon that side; which *Bur* (though it thicken not the *Matrice*, yet it) makes the side of the *Matrice* stand off the *Register*, and consequently is equivalent to thickning it.

The higher this *Bur* is raised, the better is the *Matrice Botcht*; because the thin fine points thus raised (if not pretty well flatted into the Substance of the *Bur*) will quickly either wear off by the pressure of the *Register* against them, or else flatten into the *Body* of the *Bur*, and both ways makes the *Matrice* again too thin.

Sometimes they do not *Botch* the *Matrice* thus for this fault; but only Paste a piece of Paper, or a Card, (according as it may want thicknes) against the thin side of the *Matrice* and so thicken it.

But to mend the sides I use another Expedient, *viz.* by Soldering a piece of *Plate-Brass* against its thin side or sides, which is much better than *Botching* it.

Secondly, If the *Matrice* be filed away too much at the *Foot*, they knock it up with the *Pen* of the *Hammer*; and stretch it between the *Foot* and the *Orifice* of the *Matrice*, and then *Justifie* it again in *Line*. Or a piece may be *Soldered* under the *Foot*.

Thirdly, If the *Face* of the *Matrice* be too much taken away, and either the *Punch* spoiled or the *Notch* in the back of the *Matrice* made so, as it cannot be *Sunken* deeper, they raise a *Bur* on the *Face*, as they did on the thin sides, to keep the *Matrice* off the *Carriages* and *Bodies* which Lengthens the height of the Letter against *Paper* so much as is the height of the raised *Bur*. But of all the *Botches* this is the worst, because the *Beard* lies now nearer the *Face*: And the hollow standing off of the *Face* of the *Matrice* from the *Carriages* and *Bodies*, subjects the *Mettal* to run between them, and so pesters the *Workman* to get the Letter out of the *Mold* and *Matrice*.

Sect. XVIII, Of setting up the Furnance:

HAVING *Justified* the *Mold* and *Matrice*, we come now to *Casting* of Letters: But yet we have neither *Furnance*, *Mettal*, or *Ladle*. Wherefore it is the *Founders* care, first to provide these.

The *Furnance* I have described in *Plate 20*. It is built of *Brick* upright, with four square sides and a *Stone* on the top, in which *Stone* is a wide round hole for the *Pan* to stand in.

a b c d The

a b c d The Square Stone at the top, covering the whole *Furnance*. This is indeed the *Furnance*.

a d, b c The breadth two Foot and one Inch.

a b, c d The Length two Foot three Inches. In to the Breadth and Length about the whole Stone, is let in even with the top of the Stone a square *Iron Band* two Inches deep, and a quarter and half quarter of an Inch thick to preserve the Edges of the Stone from battering.

e The round hole the *Pan* stands in, which hath an *Iron Plate* let into it eight Inches diameter, an Inch and half broad and one quarter of an Inch thick.

This *Iron-Plate* fits the *inside* of the *Hole* so far as it is Circular, and consequently is a *Segment* of a *Circle*. But where the *Smoak-vent* breaks off the Circularity of the Stone, there ends this Plate of *Iron*, that the *Smoak* may have the freer vent. Its Office also is to preserve the Edge of the *Hole* from battering, with the oft taking out and putting in the *Iron Pan*.

f The *Funnel* seven Inches high, and five Inches wide.

g The *Stoke-Hole* four Inches wide, and six Inches long.

b b The height of the *Furnance* two Foot ten Inches.

i The *Air-Hole* just underneath the *Hearth* to let in Air that the Fire may burn the freer.

k The *Ash-Hole* where the *Ashes* that fall from the *Hearth* are taken away.

Z 2

l m n o The

Immo The *Bench* two Foot broad, three Foot long, and two Foot eight Inches high. The *Bench* is to empty the Letters out of the *Mold* upon, as the *Founder* *Cast*s them.

The *Hearth* lies seven Inches below the top of the round *Hole*, and hath under it another round *Iron-Ring* of the same demenſions with the firſt, on which ſtraight *Iron-Bars* are faſtened that the *Fire* is laid on.

In the round *Iron-Ring* (or rather Segment) on the top of the *Furnance* is ſet the *Pan*, which is either a *Plate Ladle*, or a ſmall *Caſt-Iron Kettle* that ſinks into it within two Inches of the *Brim*s of the *Pan*.

¶ 2. Of making Mettal.

The *Mettal Founders* make *Printing Letters* of, is *Lead* hardned with *Iron* : Thus they chuſe *ſub-Nails* for the beſt *Iron* to Melt, as well becauſe they are aſured *ſub-Nails* are made of good ſoft and tough *Iron*, as becauſe (they being in ſmall pieces of *Iron*) will Melt the ſooner.

To make the *Iron Run*, they mingle an equal weight of *Antimony* (beaten in an *Iron-Morter* into ſmall pieces) and *ſub-Nails* together. And preparing ſo many *Earthen* forty or fifty pounds *Melt-ing-Pots* (made for that purpoſe to endure the *Fire*) as they intend to uſe : They *Charge* theſe *Pots* with the mingled *Iron* and *Antimony* as full as they will hold.

Every

Every time they Melt *Mettal*, they build a new *Furnance* to melt it in : This *Furnance* is called an *Open Furnance* ; because the Air blows in through all its sides to Fan the *Fire*: They make it of Bricks in a broad open place, as well because the Air may have free access to all its sides, as that the Vapours of the *Antimony* (which are Obnoxious) may the less offend those that officiate at the *Making* the *Mettal* : And also because the Violent Fire made in the *Furnance* should not endanger the Firing any adjacent Houses.

They consider before they make the *Furnance* how many *Pots* of *Mettal* they intend to Melt, and make the *Furnance* sizable to that number : We will suppose *five Pots*. Therefore they first make a Circle on the Ground capable to hold these five *Pots*, and wider yet by three or four Inches round about : Then within this Circle they lay a Course of Bricks close to one another to fill the Plain of that Platform, with their broad or flat sides downwards, and their ends all one way, and on this Course of Bricks they lay another Course of Bricks as before, only the Lengths of this Course of Bricks lies athwart the Breadths of the other Course of Bricks : Then they lay a third Course of Bricks with their lengths cross the Breadth of the second Course of Bricks.

Having thus raised a Platform, they place these five *Pots* in the middle of it close to one another, and then on the Foundation or Plat-form raise the *Furnance* round about by laying the Bricks of the first Lay end to end and flat, close to one another :

On the second *Lay*, they place the middle of a Brick over a *Joynt* (as *Brick-layers* call it) that is where the ends of two Bricks joyn together, and so again lay Bricks end to end till they *Trim* round the *Platform*. Then they lay a third *Lay* of Bricks, covering the *Joynts* of the second *Lay* of Bricks as before : So is the Foundation finisht.

Then they raise the Walls to the *Furnance* on this Foundation; But do not lay the ends of their Bricks close together. But lay the ends of each Brick about three Inches off each other, to serve for *Wind-boles* till they *Trim* round about : Then they lay another *Lay* of Briks leaving other such *Wind-boles* over the middle of the last *Lay* of Bricks, and so *Trim* as they work round either with half Bricks or Bats that the *Wind-boles* of the last *Lay* may be covered : And in this manner and order they lay so many *Lays* till the Walls of the *Furnance* be raised about three Bricks higher than the *Months* of the *Melting-Pots*, still observing to leave such *Wind-boles* over the middle of every Brick that lies under each *Lay*.

Then they fill the sides of the *Furnance* round about the *Melting-Pots*, and over them with *Char-coal*, and *Fire* it at several *Wind-boles* in the bottom till it burn up and all over the *Furnance*, which a moderate Wind in about an Hours time will do : And about half an Hours time after they lay their Ears near the Ground and listen to hear a *Bubling* in the *Pots*; and this they do so often till they do hear it. When they hear this *Bubling*, they conclude the *Iron* is melted : But yet they will let it stand, perhaps half an hour longer or more, according as they guess
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the Fire to be Hotter or Cooler, that they may be the more assured it is all thoroughly Melted. And when it is Melted the Melting *Pot* will not be a quarter full.

And in or against that time they make another small *Furnance* close to the first, (to set an *Iron Pot* in, in which they Melt *Lead*) on that side from whence the Wind blows ; Because the Person that Lades the *Lead* out of the *Iron-Pot* (as shall be shewed by and by) may be the less annoyed with the Fumes of the *Mettal*, in both *Furnances*. This *Furnance* is made of three or four *Course* of Bricks open to the windward, and wide enough to contain the designed *Iron Pot*, with room between it and the sides to hold a convenient quantity of *Charcoal* under it, and about it.

Into this *Iron-Pot* they put for every three Pound of *Iron*, about five and twenty pounds of *Lead*. And setting Fire to the *Coals* in this little *Furnance* they Melt and Heat this *Lead* Red-hot.

Hitherto a Man (nay, a Boy) might officiate all this Work ; But now comes Labour would make *Hercules* sweat. Now they fall to pulling down so much of the side of the open *Furnance* as stands above the Mouth of that *Melting-Pot* next the *Iron-Pot*, And having a thick strong *Iron Ladle*, whose *Handle* is about two Yards long, and the *Ladle* big enough to hold about ten Pounds of *Lead*, and this *Ladle* Red-hot that it chill not the *Mettal*, they now I say with this *Ladle* fall to clearing this first *Melting-Pot* of all the *Coals* or filth that lie on the top of the Melted *Mettal*: while another Man at the same time stand

stands provided with a long strong round *Iron Stirring Poot*, the *Handle* of which *Stirring Poot* is also about two Yards long or more, and the *Poot* it self almost twice the length of the depth of the Melting *Pot*. This *Poot* is nothing but a piece of the same *Iron* turned to a square with the *Handle* : And this *Poot* is also in a readiness heated Red-hot.

Now one Man with the *Ladle Lades* the *Lead* out of the *Iron-Pot* into the Melting *Pot*, while the other Man with the *Poot* stirs and Labours the *Lead* and *Mettal* in the Melting *Pot* together till they think the *Lead* and *Mettal* in the Melting *Pot* be well incorporated : And thus they continue *Lading* and *Stirring* till they have near filled the Melting *Pot*.

Then they go to another next Melting-*Pot*, and successively to all, and Lade and stir *Lead* into them as they did into the first. Which done the *Mettal* is made : And they pull down the *Walls* of the *Open Furnance*, and rake away the Fire that the *Mettal* may cool in the *Pots*.

Now (according to Custom) is Half a Pint of Sack mingled with Sallad Oyl, provided for each Workman to Drink ; intended for an Antidote against the Poysonous Fumes of the *Antimony*, and to restore the Spirits that so Violent a Fire and Hard Labour may have exhausted.

§ 3. Of Letter-Ladles.

Letter-Ladles differ nothing from other common *Ladles*, save in the size: Yet I have given you a Draft of one in Plate 20 at A. Of these the *Caster* has many at Hand, and many of several sizes that he may successively chuse one to fit the several sizes of *Letters* he has to *Cast*; as well in *Bodies* as in *Thicknesses*.

§ XIX. § 1. Of Casting, Breaking, Rubbing, Kerning, and setting up of Letters.

BEfore the *Caster* begins to *Cast* he must kindle his *Fire* in the *Furnance*, to *Melt* the *Mettal* in the *Pan*. Therefore he takes the *Pan* out of the Hole in the Stone, and there lays in *Coals* and kindles them. And when it is well kindled, he sets the *Pan* in again, and puts *Mettal* into it to *Melt*. If it be a small *Bodied-Letter* he *Casts*, or a thin *Letter* of Great *Bodies*, his *Mettal* must be very hot; nay, sometimes Red-hot to make the *Letter Come*. Then having chose a *Ladle* that will hold about so much as the *Letter* and *Break* is, he lays it at the *Stoking-hole*, where the Flame bursts out to heat. Then he ties a thin Leather cut into such a Figure as is described in Plate 20 at B with its narrow end against the *Face* to the *Leather-Groove* of the *Matrice*, by whipping a Brown Thred twice about the *Leather-Groove*, and fastning the Thred with a Knot. Then he puts both Halves of the *Mold* together, and puts

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the *Matrice* into the *Matrice Cheek*, and places the *Foot* of the *Matrice* on the *Stool* of the *Mold*, and the broad end of the *Leather* upon the *Wood* of the upper half of the *Mold*, but not tight up, lest it might hinder the *Foot* of the *Matrice* from *Sinking* close down upon the *Stool* in a train of Work. Then laying a little *Rosin* on the upper *Wood* of the *Mold*, and having his *Casting Ladle* hot, he with the boiling side of it Melts the *Rosin*; And when it is yet *Melted* presses the broad end of the *Leather* hard down on the *Wood*, and so fastens it to the *Wood*. All this is Preparation,

Now he comes to *Casting*. Wherefore placing the under-half of the *Mold* in his left hand, with the *Hook* or *Hag* forward, he clutches the ends of its *Wood* between the lower part of the *Ball* of his Thumb and his three hind-Fingers. Then he lays the upper half of the *Mold* upon the under half, so as the *Male-Gages* may fall into the *Female-Gages*, and at the same time the *Foot* of the *Matrice* place it self upon the *Stool*. And clasping his left-hand Thumb strong over the upper half of the *Mold*, he nimbly catches hold of the *Bow* or *Spring* with his right-hand Fingers at the top of it; and his Thumb under it, and places the point of it against the middle of the *Notch* in the backside of the *Matrice*, pressing it as well forwards towards the *Mold*, as downwards by the *Shoulder* of the *Notch* close upon the *Stool*, while at the same time with his hinder-Fingers as aforesaid, he draws the under-half of the *Mold* towards the *Ball* of his Thumb, and thrusts by the *Ball* of his Thumb the upper part towards his Fingers,

gers, that both the *Registers* of the *Mold* may press against both sides of the *Matrice*, and his Thumb and Fingers press both Halves of the *Mold* close together.

Then he takes the Handle of his *Ladle* in his right Hand, and with the *Boll* of it gives a stroak two or three outwards upon the *Surface* of the *Melted Mettal* to scum or cleer it from the Film or Dust that may swim upon it. Then takes up the *Ladle* full of *Mettal*, and having his *Mold* as aforesaid in his left hand, he a little twists the left-side of his *Body* from the *Furnance*, and brings the *Geat* of his *Ladle* (full of *Mettal*) to the *Mouth* of the *Mold*, and twists the upper part of his right-hand towards him to turn the *Mettal* into it, while at the same moment of Time he Jilts the *Mold* in his left hand forwards to receive the *Mettal* with a strong *Shake* (as it is call'd) not only into the *Bodies* of the *Mold*, but while the *Mettal* is yet hot, running swift and strongly into the very *Face* of the *Matrice* to receive its perfect Form there, as well as in the *Shanck*.

Then he takes the upper half of the *Mold* off the under half, by placing his right-Hand Thumb on the end of the *Wood* next his left-Hand Thumb, and his two middle Fingers at the other end of the *Wood*, and finding the *Letter* and *Break* lie in the under-Half of the *Mold* (as most commonly by reason of its weight it does) he throws or tosses the *Letter Break* and all upon a Sheet of Waste Paper laid for that purpose on the *Bench* just a little beyond his left-hand, and is then ready to *Cast* another *Letter* as be-

fore, and also the whole number that is to be *Cast* with that *Matrice*.

But sometimes it happens that by a *Shake*, or too big a *Ladle*, the *Mettal* may spill or slabber over the *Mouth* of the upper Half of the *Mold*, so that the spilt *Mettal* sticking about the out-sides of the *Mouth*, may lift the Letter off the under half of the *Mold*, and keep it in the upper half. Therefore he with the point of the *Hag* in the Wood of the under half of the *Mold*, picks at the hollow in the fore part of the *Break* made by the *Shaking* out of the *Mettal*, and draws *Break* and *Letter* both out. It sometimes sticks in the under Half of the *Mold* by the same cause, and then he uses the point of the *Hag* in the upper half of the *Mold*, to pick or hale it out, as before.

It also sometimes sticks when any of the Joynts of the *Mold* open never so little, the *Mettal* thus getting in between those Joynts : But this fault is not to be indured, for before he can *Cast* any more, this fault must be mended.

But besides *Letters*, there is to be *Cast* for a perfect *Fount* (properly a *Fund*) *Spaces* Thick and Thin, n *Quadrats*, m *Quadrats* and *Quadrats*. These are not *Cast* with *Matrices* but with *Stops* (as we may call them) Because when these are *Cast* they are all shorter than the *Shanck* of the Letter, that they may not *Print*. Therefore they take off the *Register* of the under-Half *Mold*, and fit a piece of *Plate-Brass* about a *Brevier* Thick and a *Brevier* longer than to reach to the edge of the *Body* in the place of the *Register*, and drill a hole in this *Plate-Brass* right against the

the Hole in the *Carriage* that the *Female-Screw* lies in : This Hole is made so wide that the *Male-Screw* which screwed the *Register* close to the *Carriage* and *Body* may enter in at it, and screw this *Plate-Brass* close to them, as it did the *Register* : Then they make a mark with the point of a *Needle* on the *Plate-Brass* just against the side of the Edge of the *Body*, and at this mark they double down the end of the *Plate-Brass* inwards to make a perfect *Square* with the inside of the whole *Plate*. This doubling down is called the *Stop* aforesaid, and must be made just so thick as they design the *Thin* or *Thick Space* to be, and must have its *Upper* and *Under-Edges* filed so exactly to the *Body*, that it may lie close upon the *Under-Carriage*, and just even so high as the upper-side of the *Body*. So that when the *Upper-half* of the *Mold* is placed on the under-Half, and *Mettal* Cast in at the *Mouth* (as before) the *Mettal* shall descend no deeper between the two *Bodies* then just to his *Stop* : You must note that this *Stop* must be filed exactly true as to *Body* and *Thickness* : For if it be never so little too big in *Body*, the *Carriage* of the *Mold* will ride upon it and make the *Body* of the *Space* bigger. Or if the *Body* be never so little too little, the *Hot Mettal* will run beyond the *Stop* ; both which *Miscarriages* in making the *Stop*, spoil the *Space*.

If the *Space* be too short, they *File* the end of the *Stop* shorter.

This *Brevier* thick *Plate* will be thick enough for *Stops* for the *Thin* or *Thick Spaces* of any *Body* though of *Great-Cannon*, and for the *Quadrat Stop*.

of any Body under a *Great Primmer*. And for the *m Quadrat Stop* of all to a *Brevier* and all Bodies under it. But for *Stops* that require to be Thicker then a *Brevier*, instead of doubling the *Stop* inwards on the *Plate*, I *Solder* on the in-side of that end of the *Plate* a *Stop* full big enough in Body, and big enough in Thickness for the *Quadrat* I intend to make, and afterwards file and fit the *Stop* exactly as before.

When they *Cast* these *Spaces* or *Quadrats*, this *Stop* is always screwed fast upon the *Carriage* of the under-Half *Mold* as aforesaid. So that they only fit the upper half *Mold* on the under, and *Cast* their Number almost twice as quick as they do the *Letters* in *Matrices*.

It is generally observed by *Work-men* as a Rule, That when they *Cast Quadrats* they *Cast* them exactly to the Thickness of a set Number of *m's* or *Body*, viz. two *m's* thick, three *m's* thick, four *m's* thick, &c. And therefore the *Stops* aforesaid must all be filed exactly to their several intended thicknesses, The reason is, that when the *Compositer* Indents any Number of Lines, he may have *Quadrats* so exactly *Cast* that he shall not need to *Justifie* them either with *Spaces* or other helps.

¶ 2. Some Rules and Circumstances to be observed in Casting.

1. If the Letter be a small *Body*, it requires a Harder *Shake* than a great *Body* does: Or if it be a thin Letter though of a greater *Body*, especially
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small *i*, being a thin Letter its Tittle will hardly *Come* ; So that sometimes the *Caster* is forced to put a little *Black-Tin* into his *Mettal*, which makes the *Mettal* Thinner, and consequently have a freer flux to the *Face* of the *Matrice*.

2. He often examines the *Registers* of the *Mold*, by often *Rubbing* a *Cast* Letter : For notwithstanding the *Registers* were carefully *Justified* before, and hard screwed up ; yet the constant thrusting of both *Registers* against the sides of the *Matrice*, may and often do force them more or less to drive backwards. Or a fall of one half or both Halfs of the *Mold*, may drive them backwards or forwards : Therefore he examines, as I said, how they *Rub*, whether too Thick or too Thin. And if he see Cause, mends the *Registers*, as I shew'd § 5. ¶ 2.

Or if the *Matrice* be *Botcht*, as I shew'd you § 5. ¶ 3. then those *Botches* (being only so many fine points rising out of the Body of the *Copper* of the *Matrice*) may with so many reiterated pressures of the *Registers* against them, flatten more and more, and press towards the Body of the *Matrice*, and consequently make the Letter Thinner : Which if it do, this must be mended in the *Matrice* by re-raising it to its due Thickness.

3. He pretty often examines, as I shew'd in § 5. ¶ 2. how the Letters stand in *Line*: For when great Numbers are *Cast* with one *Matrice*, partly by pressing the point of the *Wyer* against the *Bottom-Shoulder* of the *Notch* in the back-side of the *Matrice*, and partly by the softness of the matter of his *Matrice* and hardness of the *Iron-fool*, the *Foot* of the *Matrice* (if

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it wear not) may batter so much as to put the Letter out of Line. This must be mended with a *Botch*, viz. by knocking up the *Foot* of the *Matrice*, as I shew'd § 5. ¶ 3.

A Work-man will *Cast* about four thousand of these Letters ordinarily in one day.

¶ 3. Of Breaking off Letters.

Breaking off is commonly Boys-work: It is only to *Break* the *Break* from the *Shanck* of the *Letter*. All the care in it is, that he take up the *Letter* by its Thickness, not its *Body* (unless its Thickness be equal to its *Body*) with the fore-Finger and Thumb of his right Hand as close to the *Break* as he can, lest if when the *Break* be between the fore-Finger and Thumb of his left Hand, the force of *Breaking off* the *Break* should bow the *Shanck* of the *Letter*.

¶ 4. Of Rubbing of Letters.

Rubbing of Letters is also most commonly Boys-work: But when they do it, they provide *Finger-stalls* for the two fore-Fingers of the right-Hand: For else the Skin of their Fingers would quickly rub off with the sharp greet of the Stone. These *Finger-stalls* are made of old *Ball-Leather* or *Pelts* that *Printers* have done with: Then having an heap of one sort of *Letters* lying upon the Stone before them, with the left-Hand they pick up the *Letter* to be *Rub'd*, and lay it down in the *Rubbing* place with
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one of its sides upwards they clap the Balls of the fore-Finger and middle-Finger upon the fore and hinder-ends of the *Letter*, and *Rubbing* the *Letter* pretty lightly backwards about eight or nine Inches, they bring it forwards again with an hard pressing *Rub* upon the *Stone*; where the fore-Finger and Thumb of the left-Hand is ready to receive it, and quickly turn the opposite side of the *Letter*, to take such a *Rub* as the other side had.

But in *Rubbing* they are very careful that they press the Balls of their Fingers equally hard on the *Head* and *Foot* of the *Letter*. For if the *Head* and *Foot* be not equally prest on the *Stone*, either the *Head* or *Foot* will *Drive out* when the *Letters* come to be *Composed* in the *Stick*; So that without *Rubbing* over again they cannot be *Drest*.

¶ 5. Of Kerning of Letters.

Amongst the *Italick-Letters* many are to be *Kern'd*, some only on one side, and some both sides. The *Kern'd-Letters* are such as have part of their *Face* hanging over one side or both sides of their *Shanck*; These cannot be *Rub'd*, because part of the *Face* would *Rub* away when the whole side of the *Shanck* is toucht by the *Stone*: Therefore they must be *Kern'd*, as *Founders* call it: Which to do, they provide a small *Stick* bigger or less, according as the *Body* of the *Letter* that is to be *Kern'd*. This *Kerning-stick* is somewhat more than an *Handful* long, and it matters not whether it be square or round: But if it be square the *Edges* of it must be pret-

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ty well rounded away, lest with long usage and hard Cutting they Gall the Hand. The upper side of this *Kerning-Stick* is flatted away somewhat more than the length of the *Letter*, and on that flat part is cut away a flat bottom with two square sides like the Sides or *Ledges* of the *Lining-stick* to serve for two *Sholders*. That side to be *Kern'd* and *scrap'd*, is laid upwards, and its opposite side on the bottom of the *Kerning-stick* with the *Foot* of the *Letter* against the bottom *Sholder*, and the side of the *Letter* against the side *Sholder* of the *Kerning-stick*.

He also provides a *Kerning-Knife* : This is a pretty strong piece of a broken Knife, about three Inches long, which he fits into a Wooden-Handle : But first he breaks off the Back of the Knife towards the Point, so as the whole edge lying in a straight-line the piece broken off from the back to the edge may leave an angle at the point of about 45 Degrees, which irregular breaking (for so we must suppose it) he either *Grinds* or *Rubs* off on a *Grind-stone*. Then he takes a piece of a Broom-stick for his Handle, and splits one end of it about two Inches long towards the other end, and the split part he either Cuts or Rasps away about a *Brevier* deep round about that end of the Handle. Then he puts about an Inch and an half of his broken blade into the split or slit in the Handle, and ties a four or five doubled Paper a little below the Rased part of the Handle round about it, to either a *Pica* or *Long-Primmer* thick of the slit end of the Handle. This Paper is so ordered that all its sides round about shall stand equally distant from all the

he Rasped part of the Handle : For then setting the other end of the Handle in Clay, or otherwise fastening it upright, when *Mettal* is poured in between the Rasped part of the Handle and the Paper about it, that *Mettal* will make a strong *Ferril* to the *Handle* of the *Knife*. The irregularities that may happen in *Casting* this *Ferril* may be Rasped away to make it more handy and Handsome.

Now to return again where I left off. Holding the *Handle* of the *Kerning-stick* in his left-Hand, He lays the side of the *Letter* to be *Kern'd* upwards with the *Face* of the *Letter* towards the end of the *Kerning-stick*: the side of the *Letter* against the side *Sholder* of the *Kerning-stick*, and the *Foot* of the *Letter* against the bottom *Sholder* of the *Kerning-stick*, and laying the end of the Ball of his left-Hand Thumb hard upon the *Shanck* of the *Letter* to keep its *Side* and *Foot* steady against the *Sholders* of the *Kerning-stick*, he with the *Kerning-Knife* in his right-Hand cuts off about one quarter of the *Mettal* between the *Beard* of the *Shanck* and the *Face* of the *Letter*. Then turning his *Knife* so as the back of it may lean towards him, he scrapes towards him with the edge of the *Knife* about half the length of that upper-side, viz. about so much as his Thumb does not cover: Then he turns the *Face* of the *Letter* against the lower *Sholder* of the *Kerning-stick*, and scraping fromwards him with a stroak or two of his *Knife* smoothenes that end of the *Letter* also.

If the other side of the *Letter* be now to be *Kern'd*

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it was before *Rub'd* on the *Stone*, as was shewed in the last ¶: But if it be to be *Kern'd*, then he makes a little hole in his *Kerning-stick*, close to the lower *Sholder* of it and full deep enough to receive all that part of the *Face* of the *Letter* that hangs over the *Shanck*, that the *Shanck* of the *Letter* may lie flat and solid on the bottom of the *Kerning-stick*, and that so the *Shanck* of the *Letter* bow not when the weight of the *Hand* presses the edge of the *Kerning-Knife* hard upon it. Into this hole he puts (as before said) so much of the *Face* of the *Letter* as hangs over the side of the *Shanck*, and so scrapes the lower end of the *Letter* and *Kerns* the upper end, as he did the former side of the *Letter*.

¶ 6. Of Setting up, or Composing Letters.

I described in § 5. ¶ 2. the *Lining-stick*, But now we are come to *Setting up*, or *Composing* of *Letters*. The *Founder* must provide many *Composing-sticks*; five or six dozen at the least. These *Composing-sticks* are indeed but long *Lining-sticks*, about seven or eight and twenty Inches long *Handle* and all; Whereof the *Handle* is about three Inches and an half long: But as the *Lining-stick* I described was made of *Brass*: So these *Composing-sticks* are made of *Beech-Wood*.

When the Boy *Sets up Letters* (for it is commonly Boys Work) The *Caster Casts* about an hundred *Quadrats* of the same *Body* about half an Inch broad at least, let the *Body* be what it will, and of the

the length of the whole *Carriage*, only by placing a flat *Brass* or *Iron Plate* upon the *Stool* of the *Mold* close against the *Carriage* and *Body*, to stop the *Mettal* from running farther.

The Boy (I say) takes the *Composing-stick* by the *Handle* in his left-Hand, clasping it about with his four Fingers, and puts the *Quadrat* first into the *Composing-stick*, and lays the Ball of his Thumb upon it, and with the fore-Finger and Thumb of his right-Hand, assisted by his middle Finger to turn the *Letter* to a proper position, with its *Nick* upwards towards the bottom side of the *Composing-stick*; while it is coming to the *Stick*, he at the same time lifts up the Thumb of his left-Hand, and with it receives and holds the *Letter* against the fore-side of the *Quadrat*, and after it, all the *Letters* of the same sort, if the *Stick* will hold them, If not he *Sets* them in so many *Sticks* as will hold them: Observing to *Set* all the *Nicks* of them upwards, as aforesaid. And as he *Set* a *Quadrat* at the beginning of the *Composing-stick*, so he fills not his *Stick* so full, but that he may *Set* another such *Quadrat* at the end of it.

¶ 7. *Some Rules and Circumstances to be observed in Setting up Letters.*

1. If they *Drive* a little out at *Head* or *Foot*, so little as not to require new *Rubbing* again, then he holds his Thumb harder against the *Head* or *Foot*, so as to draw the *Driving* end inward: For else when they come to *Scraping*, and *Dressing* the *Hook* of the

Dressing-Hook drawing Square, will endanger the middle or some other part of *Letters* in the *Stick* to *Spring* out : And when they come into the *Dressing-block*, the *Knots* of the *Blocks* drawing also square subject them to the same inconvenience. And if they *Drize* out at the *Head*, the *Feet* will more or less stand off one another : So that when the *Tooth* of the *Plow* comes to *Dress* the *Feet*, it will more or less job against every *Letter*, and be apt to make a bowing at the *Feet*, or at least make a *Bur* on their sides at the *Feet*.

2. When *Short-Letters* are begun to be *Set* up in a *Stick*, the whole *Stick* must be fill'd with *Short-Letters* : Because when they are *Dressing*, the *Short-Letters* must be *Bearded* on both sides the *Body* : And should *Short-Letters* or *Ascending* or *Descending* or *Long* stand together, the *Short* cannot be *Bearded* because the *Stems* of the *Ascending* or *Descending* or *Long-Letters* reach upon the *Body* to the *Beard* : So that the *Short-Letters* cannot be *Bearded*, unless the *Stems* of the other *Letters* should be scraped off.

3. When *Long-Letters* are begun to be *Set* up in the *Stick*, none but such must fill it, for the reason aforesaid.

4. If any *Letters Kern'd* on one side be to be *Set* up, and the *Stems* of the same *Letters* reach not to the opposite *Beard* as *s* or *f*, in *Setting* up these or such like *Letters*, every next *Letter* is turned with its *Nick* downwards, that the *Kern* of each *Letter* may lie over the *Beard* of its next. But then they must be all *Set* up again with a *Short-Letter*

Letter between each, that they may be *Bearded*.

As every *Stick-full* is set up, he sets them by upon the *Racks*, ready for the *Dresser* to *Dress*, as shall be shewed in the next §.

The *Racks* are described in *Plate 21.* at A. They are made of Square *Deal Battens* about seven Inches and an half long, as at *a b a b a b*, and are at the ends *b b* let into two upright *Stiles*, standing about sixteen Inches and an half assunder, and the fore-ends of the *Racks* mounting a little, that when *Sticks* of *Letters* is Set by on any two parallel *Racks*, there may be no danger that the *Letters* in them shall slide off forward; but their *Feet* rest against the *Bottom-Ledges* of the *Composing-sticks*. They set by as many of these *Sticks* with *Letter* in them, as will stand upon one another between every two *Rails*, and then set another pile of *Sticks* with *Letter* in them before the first, till the length of the *Rail* be also filled with *Sticks* of *Letter* before one another. They set all the *Sticks* of *Letters* with their ends even to one another with the *Faces* of the *Letter* forwards.

This *Frame of Racks* is always placed near the *Dressing-Bench*, that it may stand convenient to the *Letter-Dressers* Hand.

§ 20. ¶ 1. Of Dressing of Letters.

There be several Tools and Machines used to the *Dressing of Letters*: And unless I should describe them to you first, you might perhaps in my following discourse not well understand me :

me: Wherefore I shall begin with them: They are as follows.

1. The *Dressing-Sticks*.
2. The *Bench, Blocks* and its Appurtenances.
3. The *Dressing-Hook*,
4. The *Dressing-Knife*.
5. The *Plow*.
6. The *Mallet*.

Of each of these in order.

¶ 2. Of the *Dressing-Sticks*.

I need give no other Description of the *Dressing-sticks*, than I did in the last § and ¶ of the *Composing-Sticks*: Only they are made of hard Wood, and of greater Substance, as well because hard Wood will work smoother than soft Wood, as because greater Substance is less Subject to warp or shake than smaller Substance is. And also because hard Wood is less Subject to be penetrated by the sharpness of the *Bur* of the *Mettal* on the *Letters* than the soft.

¶ 3. Of the *Block-Grove*, and its Appurtenances.

The *Block-Grove* is described in *Plate 21. a b* The *Groove* in which the *Blocks* are laid, two Inches deep, and seven Inches and an half wide at one end, and seven Inches wide at the other end: One of the *Cheeks* as *c* is three Inches and an half broad at one end, and three Inches broad at the other end, and the other *Cheek* three Inches broad the whole
Length

Length : The Length of these *Cheeks* are two and twenty Inches.

The *Wedge e f* is seven and twenty Inches and an half long, two Inches broad at one end, and three Inches and an half broad at the other end; And two Inches deep.

g g g g The *Bench* on which the *Dressing-Blocks* are placed, are about sixteen Inches broad, and two Foot ten Inches high from the Floor. The *Bench* hath its farther Side, and both ends, railed about with slit Deal about two Inches high, that the *Hook*, the *Knife*, and *Plow*, &c. fall not off when the Work-man is at Work.

The *Blocks* are described in *Plate 21* at a b : They are made of hard Wood. These *Blocks* are six and twenty Inches long, and each two Inches square. They are *Male* and *Female*, a the *Male*, b the *Female* : Through the whole Length of the *Male-Block* runs a *Tongue* as at a b, and a *Groove* as at c d, for the *Tongue* of the *Plow* to run in; This *Tongue* is about half an Inch thick, and stands out square from the upper and under sides of the *Block*. About three Inches within the ends of the *Block* is placed a *Knot* as at c c : These *Knots* are small square pieces of *Box-wood*, the one above, and the other below the *Tongue*.

The *Female Block* is such another *Block* as the *Male Block*, only, instead of a *Tongue* running through the length of it a *Groove* is made to receive the *Tongue* of the *Male-Block*, and the *Knots* in this *Block* are made at the contrary ends, that when the *Face* of a *Stick* of *Letter* is placed on the

C c

Tongue

Tongue the *Knot* in the *Male-Block* stops the *Stick* of *Letter* from sliding forwards, while the other *Knot* in the *Female-Block* at the other end, by the knocking of a *Mallet* on the end of the *Block* forces the *Letter* between the *Blocks* forwards, and so the whole *Stick* of *Letters* between these two *Knots* are screw'd together, and by the *Wedge* *e f* in *Plate 21* (also with the force of a *Mallet*) *Wedges* the two *Blocks* and the *Stick* of *Letter* in them also tight, and close between the sides of the two *Blocks*; that afterwards the *Plow* may more certainly do its Office upon the *Foot* of the *Letter*; as shall be shew'd hereafter.

¶ 3 Of the Dressing-Hook.

The *Dressing-Hook* is described in *Plate 21* at *c*. This is a long square *Rod* of *Iron*, about two Foot long and a *Great-Primmer* square: Its end *a* is about a two-Lin'd *English* thick, and hath a small *Return* piece of *Iron* made square to the under-side of the *Rod*, that when the whole *Dressing-Hook* is laid along a *Stick* of *Letter*, this *Return* piece or *Hook* may, when the *Rod* is drawn with the *Ball* of the *Thumb*, by the *Knot* on the upper side of it at *e*, draw all the *Letter* in the *Stick* tight and close up together, that the *Stick* of *Letter* may be *Scraped*, as shall be shew'd.

§ 4. Of the Dressing-Knife.

The *Dressing-Knife* is delineated at d in *Plate. 21*. It is only a short piece of a *Knife* broken off about two Inches from the *Sholder*: But its Edge is *Basil'd* away from the back to the point pretty suddenly to make it the stronger: The *Sprig* or *Pin* of the *Handle* is commonly let into an Hole drilled into a piece of the Tip of an *Harts-horn*, as in the Figure and is fastned in with *Rosen*, as other *Knives* are into their *Handles*.

§ 5 Of the Plow.

The *Plow* is delineated in *Plate 21* at e: It is almost a common *Plain* (which I have already described in *Vol. 1. Numb. 4. Plate 4. and § 2 to 9.*) only with this distinction, that through the length of the *Sole* runs such a *Tongue*, as does through the *Male-Block* to slide tight and yet easily through the *Groove* made on the top of the *Male-block*: Its *Blade* makes an *Angle* of 60 Degrees with the *Sole* of it.

§ 21. § 1. Of Dressing of Letters.

THE *Letter Dresser* hath (as I told you before) his *Letter Set* up in *Composing-sticks*, with their *Nicks* upwards, and those *Sticks* set upon the *Racks*: Therefore he takes one *Stick* off the *Racks*, and placing the *Handle* of the *Composing-stick* in his left-hand,

he takes the contrary end of the *Dressing-stick* in his right-hand, and laying the Back of the *Dressing-stick* even upon or rather a little hanging over the Back of the *Composing-stick*, that the Feet of the Letter may fall within the Bottom-Ledge of the *Dressing-stick*; He at the same time fits the Side-Ledge of the *Dressing-stick* against the farther end of the Line of Letters in the *Composing-stick*: And holding then both *Sticks* together, his left-Hand at the Handle-end of the *Composing-stick*, and his right-Hand within about two Handfuls of the Handle-end of the *Dressing-stick*, He turns his Hands, *Sticks* and all, outward from his left-Hand, till the *Composing-stick* lies flat upon the *Dressing-stick*, and consequently the Letters in the *Composing-stick* is turned and laid upon the *Dressing-stick*.

Then he goes as near the Light as he can with the Letters in his *Dressing-stick*, and examines what Letters Come not well either in the Face or Shank: So that then holding the *Dressing-stick* in his left-Hand, and tilting the Bottom-Ledge a little downward, that the Feet of the Letter may rest against the Bottom-Ledge, and laying the Ball of his Thumb upon any certain Number of Letters between his Body and the Letter to be Cast out, He with the Foot of a Space or some thin Letter, lifts up the Letter to be Cast out, and lets it fall upon the *Dressing-Bench*: and thus he does to all the Letters in that *Stick* that are to be Thrown out.

Then taking again the *Dressing-stick* in his left-Hand at or near the handle of it, he takes the *Dressing-Hook* at the Knot, between the fore-Finger and Thumb

Thumb of his right-Hand, and laying the *Hook* over the edge of the *Quadrat* at the farther end of the *Dressing-stick*, near the *bottom-Ledge* of it, he slips his right-Hand to the *Handle* of the *Dressing-stick*, and his left-Hand towards the middle of the *Dressing-stick*, so as the end of the *Ball* of his Thumb may draw by the farther end of the *Knot* on the *Dressing-Hook* the whole *Dressing-Hook*, and the *Hook* at the end of it the whole *Stick* of *Letter* close together towards him. While at the same time he with his Fingers clutched about the *Stick* and *Letter*, and the *Thumb-ball* of his Hand presses the under flat of the *Hooking-stick* close against the *Letter* and *Dressing-stick*, that the *Letter* in the *Stick* may lie fast and manageable.

Then he takes the *Handle* of the *Dressing-Knife* in his right-Hand, and inclining the back of it towards his *Body*, that its *Basil-edge* may *Cut* or *Scraped* the *smoother*. He *Scrapes* twice or thrice upon so much of the whole *Line* of *Letters* as lies between the outer-side of the *Dressing-Hook* and the *Face* of the *Letter*.

But if twice or thrice *Scraping*, have not taken all the *Bur* or irregularities off so much of the *Letter* as he *Scraped* upon, he *Scrapes* yet longer and oftner till the whole number of *Letters* in the *Dressing-stick* from end to end seems but one intire piece of *Metal*.

Thus is that side of the fore-part (*viz.* that part towards the *Face*) of the *Shank* of the *Body* finisht.

To *Scrape* the other end of that side of the *Let-*

about

C c 3

ter

ter, viz. that towards the Feet; He turns the Handle of the Stick from him, and removing the Dressing-Hook towards the Face of the Letter which is already Scraped, he places his Thumb against the Knot of the Dressing-Hook, and presses it hard from him, that the Hook of the Dressing-Hook being now towards him, may force the whole Stick of Letter forwards against the Side-Ledge of the Dressing-stick; that so the whole Line in the Stick may lie again the faster and more manageable: Then he Scrapes with the Dressing-Knife as before, till the end of the Shank of the Letter towards the Feet be also Drest.

Then he lays by his Dressing-Hook, and keeping his Dressing-stick of Letter still in his left-Hand, he takes a second Dressing-stick, with its Handle in his right-Hand, and lays the Side-Ledge of it against the hither side of the Quadrat at the hither end of the Dressing-stick, and the bottom-Ledge of the second Stick hanging a little over the Feet of the Letter, that they may be comprehended within the bottom-Ledge of the second Dressing-stick; and so removing his left-Hand towards the middle of both Dressing-sticks, and clasping them close together, he turns both Hands outwards towards the left, till the Letter in the first Dressing-stick lie upon the second Dressing-stick, and then the Face of the Letter will lie outwards toward the right-Hand, and the Nicks upwards. Then he uses the Dressing-Hook and Dressing-Knife to Scrape this side the Line of Letter, as he did before to the other side of the Line of Letter: So shall both sides be Scraped and Drest.

Having thus Scraped both the sides, He takes the
Handle

Handle of the *Dressing-stick* into his left Hand, as before, and takes the *Male-block* into his right-Hand, and placing the *Tongue* of the *Block* against the *Face* of the *Letter* in the *Dressing-stick*, he also places the *Knot* of the *Block* against the farther side of the *Quadrat* at the farther end of the *Stick*, and so placing his right-Hand underneath the middle of the *Dressing-stick* and *Block*, he turns his Hand outwards towards the left, as before, and transfers the *Letter* in the *Dressing-stick* to the *Male-Block*: Yet he so holds and manages the *Block* that the *Shanck* of the *Letter* may rest at once upon the side of the *Block*, the *Knot* is placed in, and the *Face* of the *Letter* upon the *Tongue*.

When his *Stick* of *Letters* is thus transfer'd to the *Male-Block*, He claps the middle of the *Male-Block* into his left-Hand, tilting the *Feet* of the *Letter* a little upwards, that the *Face* may rest upon the *Tongue*, and then takes about the middle of the *Female-Block* in his right-Hand, and lays it so upon the *Male-Block*, that the *Tongue* of the *Male-Block* may fall into the *Tongue* of the *Female-Block*, and that the *Knot* at the hither end of the *Female Block* may stand against the hither side of the *Quadrat* at the hither end of the *Line* of *Letters*: So that when the *Knot* of the *Male-Block* is lightly drawn towards the *Knot* of the *Female-Block*, or the *Knot* of the *Female-Block* lightly thrust towards the *Knot* of the *Male-Block*, both *Knots* shall squeeze the *Letter* close between them.

Then he grasps both *Blocks* with the *Letter* between them in both his Hands, and lays them in the
the

the *Block-Groove*, with the *Feet* of the *Letter* upwards, and the hither side of the hither *Block* against the hither *Cheek* of the *Block-Groove*. And putting the *Wedge* into the vacant space between the *Blocks* and the further *Cheek* of the *Block-Groove*, he lightly with his right-Hand thrusts up the *Wedge* to force the *Blocks* close together, and pinch the *Letter* close between the *Blocks*.

Then with the *Balls* of the *Fingers* of both his *Hands*, he Parts gently upon the *Feet* of the *Letter*, to press all their *Faces* down upon the *Tongue*; which having done, he takes the *Mallet* in his right-Hand, and with it knocks gently upon the head of the *Wedge* to pinch the *Letter* yet closer to the insides of the *Blocks*. Then he Knocks lightly and successively upon the *Knot-ends* of both the *Blocks*, to force the *Letters* yet closer together. And then again knocks now pretty hard upon the head of the *Wedge*, and also pretty hard upon the *Knot-ends* of the *Blocks*, to Lock the *Letter* tight and close up.

Then he places the *Tongue* of the *Plow* in the upper *Groove* of the *Block*; And having the *Tooth* of the *Iron* fitted in the *Plow*, so as to fall just upon the middle of the *Feet* of the *Letter*, he grasps the *Plow* in his right-Hand, placing his *Wrist-Ball* against the *Britch* of it, and guiding the fore-end with his left-Hand, slides the *Plow* gently along the whole length of the *Blocks*; so as the *Tooth* of the *Iron* bears upon the *Feet* of the *Letter*: And if it be a small *Letter* he *Plows* upon, the *Tooth* of the *Iron* will have cut a *Groove* deep enough through the length of the whole *Block* of *Let-*

ters:

ters : But if the *Body* of the *Letter* be great, he reiterates his *Traverses* two three or four times according to the *Bigness* of the *Body* of the *Letter*, till he have made a *Groove* about a *Space* deep in the *Feet* of the *Shancks* of the whole *Blocks* of *Letter*, and have cut off all the irregularities of the *Break*.

Then with a small piece of *Buff* or some other soft *Leather*, he rubs a little upon the *Feet* of the *Letter* to smoothen them.

Then he unlocks the *Blocks* of *Letter*, by knocking with the *Mallet* upon the small end of the *Wedge*, and first takes the *Wedge* from between the *Blocks* and *Cheeks*, and lays it upon the farther *Cheek*, and afterwards takes the *Blocks* with *Letter* in it near both ends of the *Blocks* between the *Fingers* and *Thumbs* of both his *Hands*, and turns the hithermost *Block* upon the hithermost *Cheek*, and with his *Fingers* and *Thumbs* again lifts off the upper *Block*, leaving the *Letter* on the undermost *Block* with its *Face* against the *Tongue*.

Then taking the *Block* with *Letter* in it in his left-*Hand*, he places the *Knot-end* from him, and takes the *Handle* of the *Dressing-stick* in his right-*Hand*, and lays the *Side-Ledge* of it against the hither side of the *Quadrat* at the hither end, and the *Bottom-ledge* against the *Feet* of the *Letter*, he grasps the *Handle* of the *Dressing-stick* *Block* and all in his left-*Hand*, and lays his right-*Hand* *Thumb* along the under side of the *Dressing-stick* about the middle, and with the *Fingers* of the same *Hand* grasps the *Block*, and turning his *Hands*, *Block*, and *Dressing-stick* to the right, transfers the *Letter* in the *Block* upon the *Dressing-stick*.

D d

Then

Then grasping the *Dressing-stick* by the *Handle* with his left-Hand, he with his right-Hand takes the *Dressing-Hook* by the *Knot*, and lays the inside of the *Hook* of it against the farther side of the *Quadrat* at the farther end of the *Stick*; and drawing the *Hook* and *Letter* in the *Dressing-stick* with his left Thumb by the *Knot* close up toward him, he resting the *Stick* upon the *Dressing-bench* that he may Scrape the harder upon the *Beard* with the Edge of the *Dressing-Knife*, Scrapes off the *Beard* as near the *Face* as he dares for fear of spoiling it, and about a Thick Space deep at least into the *Shanck*.

If the Bottom and Top are both to be *Bearded*, He transfers the *Letter* into another *Dressing-stick*, as hath been shewed, and *Beards* it also as before.

¶ 2. *Some Rules and Circumstances to be observed in Dressing of Letters.*

1. The *Letter-Dresser* ought to be furnisht with three or four sorts of *Dressing-sticks*, which differ nothing from one another save in the Height of their Ledges. The Ledges of one pair no higher than a *Scaboard*. This pair of *Sticks* may serve to Dress, *Pearl*, *Nomparel*, and *Brevier*. Another pair whose Ledges may be a *Nomparel* high. And this pair of *Dressing-sticks* will serve to Dress *Brevier*, *Long-Primmer*, and *Pica*: Another pair whose Ledges may be a *Long-Primmer* high: And these *Dressing-sticks* may serve to Dress *Pica*, *English*, *Great-Primmer*, and *Double-Pica*. And if you will another pair of *Dressing-*

Dressing-sticks, whose *Ledges* may be an *English* High: And these *Dressing-sticks* may serve to *Dress* all big *Bodied Letters*, even to the Greatest.

2. As he ought to be furnisht with several sorts of *Dressing-sticks* as aforesaid: So ought he also to be furnisht with several *Blocks*, whose *Knots* are to correspond with the *Sizes* of the *Ledges* of the *Dressing-sticks*, for the *Dressing* of several *Bodies* as aforesaid.

3. He ought to be furnisht with three or four *Dressing-Hooks*, whose *Hooks* ought to be of the several *Depths* aforesaid, to fit and suit with the several *Bodied-Letters*.

4. He must have two *Dressing-Knives*, one to lie before the *Blocks* to *Scrape* and *Beard* the *Letter* in the *Sticks*, and the other behind the *Dressing-blocks* to use when occasion serves to *Scrape* off a small *Bur*, the *Tooth* of the *Plow* may have left upon the *Feet* of the *Letter*. And though one *Dressing-Knife* may serve to both these uses: Yet when *Work-men* are in a *Train* of *Work* they begrutch the very turning the *Body* about, or stepping one step forward or backward, accounting that it puts them out of their *Train*, and hinders their riddance of *Work*.

5. For every *Body* of *Letter* he is to have a particular *Plow*, and the *Tooth* of the *Iron* of each *Plow* is to be made exactly to a set bigness, the measure of which bigness is to be taken from the size of the *Break* that is to be *Plowed* away. For Example, If it be a *Pearl Body* to be *Plowed*, the breadth of the *Tooth* ought not to be above a thin *Scaboard*: Because the *Break* of that *Body* cannot be bigger, for Reasons I

have given before ; But the *Tooth* must be full broad enough, and rather broader than the *Break*, lest any of the irregularity of the *Break* should be left upon the *Foot* of the *Letter*. And so for every *Body* he fits the *Tooth* of the *Iron*, full broad enough and a little broader than the size of the *Break*. This is one reason why for every particular *Body* he ought to have a particular *Plow*. Another reason is.

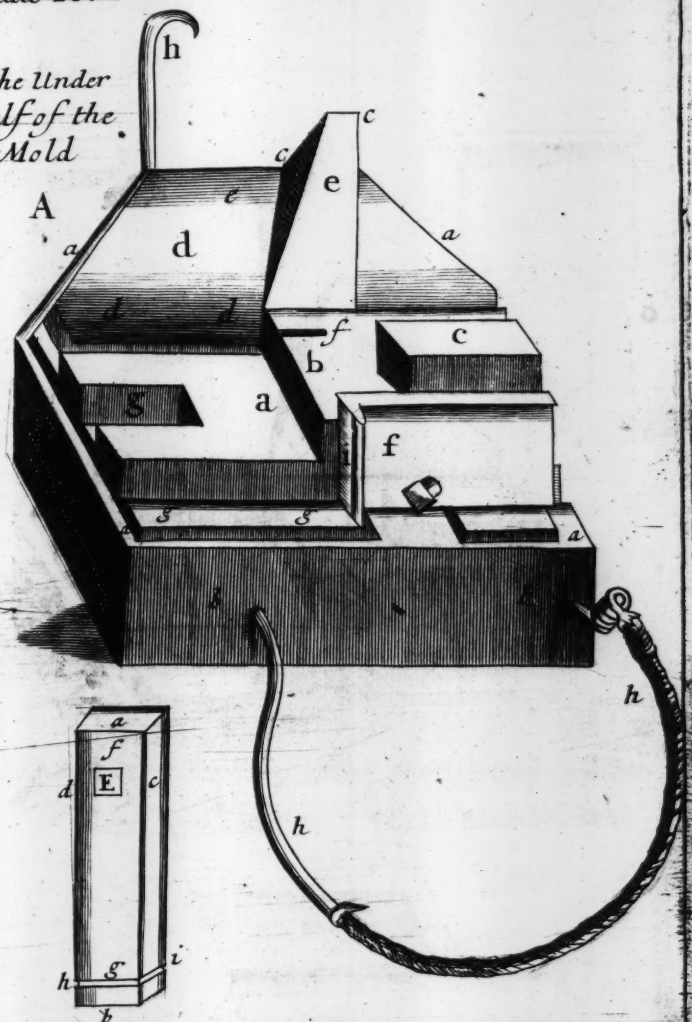
The *Tooth* of this *Plow* must be exactly set to a punctual distance from the *Tongue* of the *Plow* ; For if they should often shift *Irons* to the several *Stocks* of the *Plow*, they would create themselves by shifting more trouble than the price of a *Stock* would compensate.

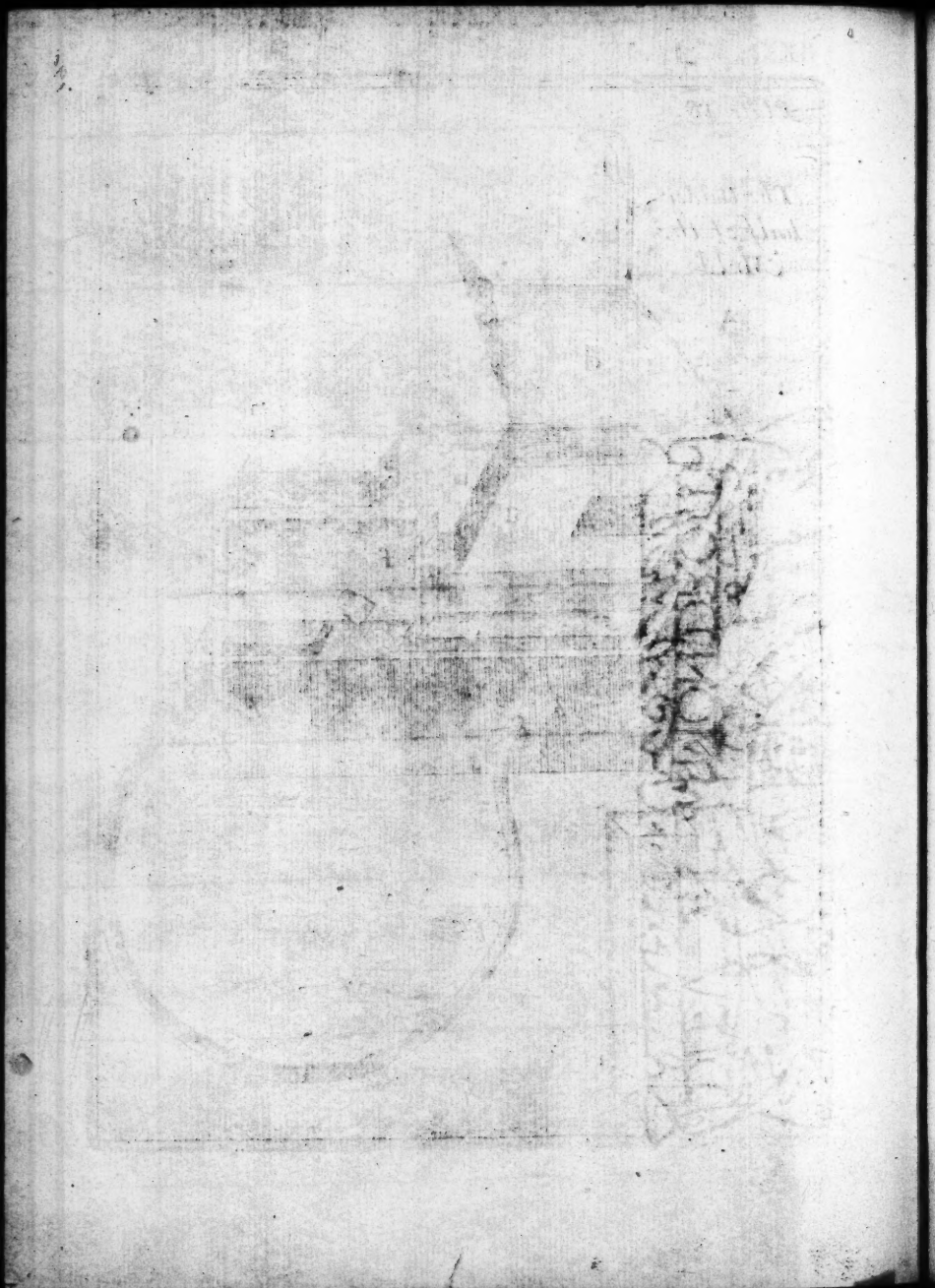
A *Fount* of *Letter* being new *Cast* and *Drest*, the *Boy Papers* up each sort in a *Cartridge* by it self, and puts about an hundred Pounds weight, viz. a *Porters Burthen* into a *Basket* to be sent to the *Master-Printers*.

The *Steel-Punches* being now *Cut*, the *Molds* made, the *Matrices Sunk*, the *Letters Cast*, and *Drest*, the application of these *Letters* falls now to the task of the *Compositer* ; whose *Trade* shall be (God willing) the Subject of the next *Exercises*.

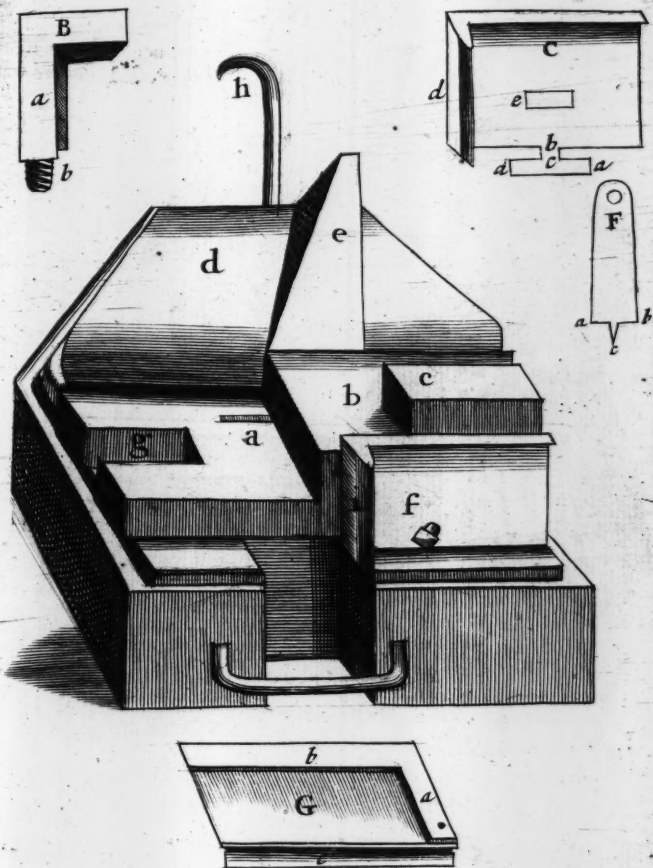
F I N I S.

*The Under
half of the
Mold*





The Upper half of the Mold



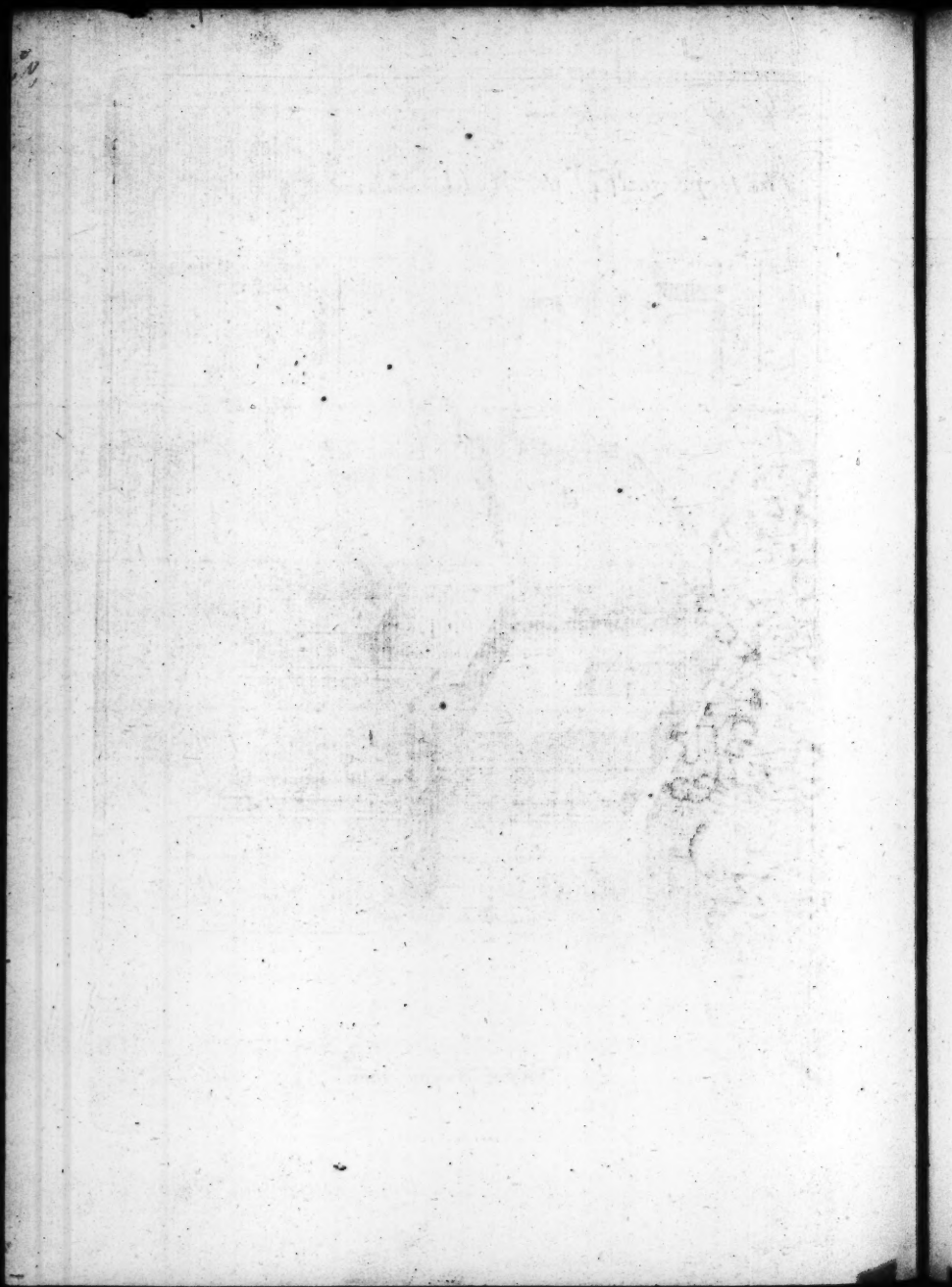


Plate 20.



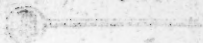
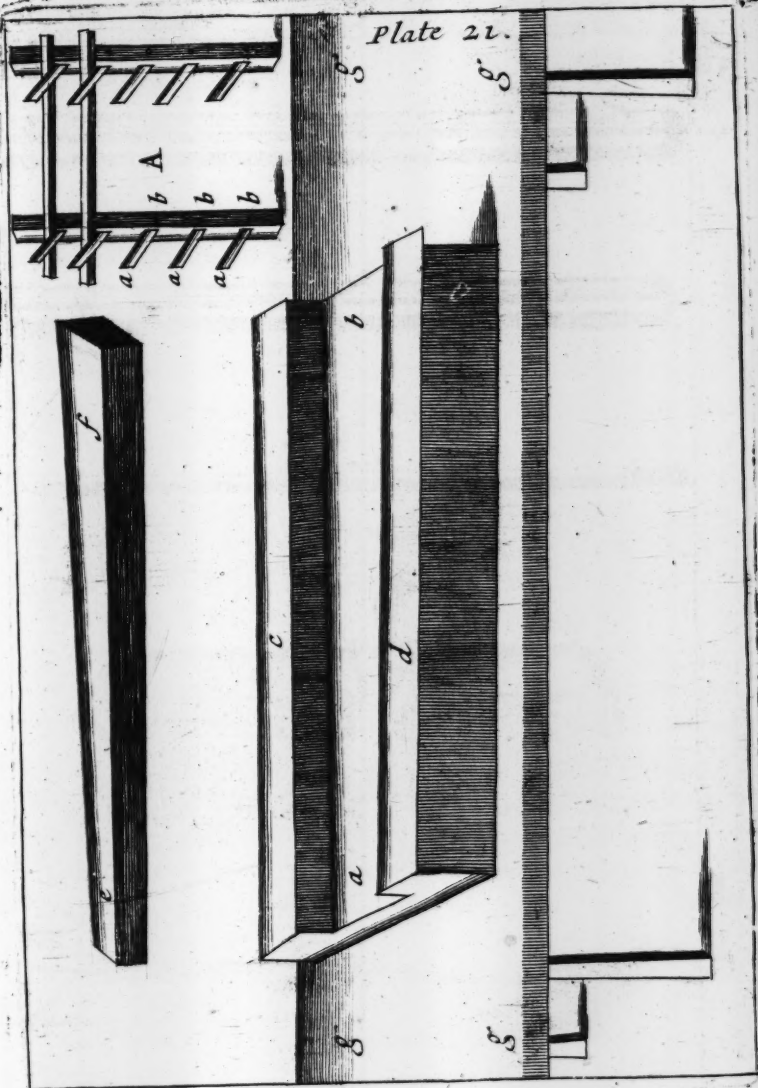


Plate 21.



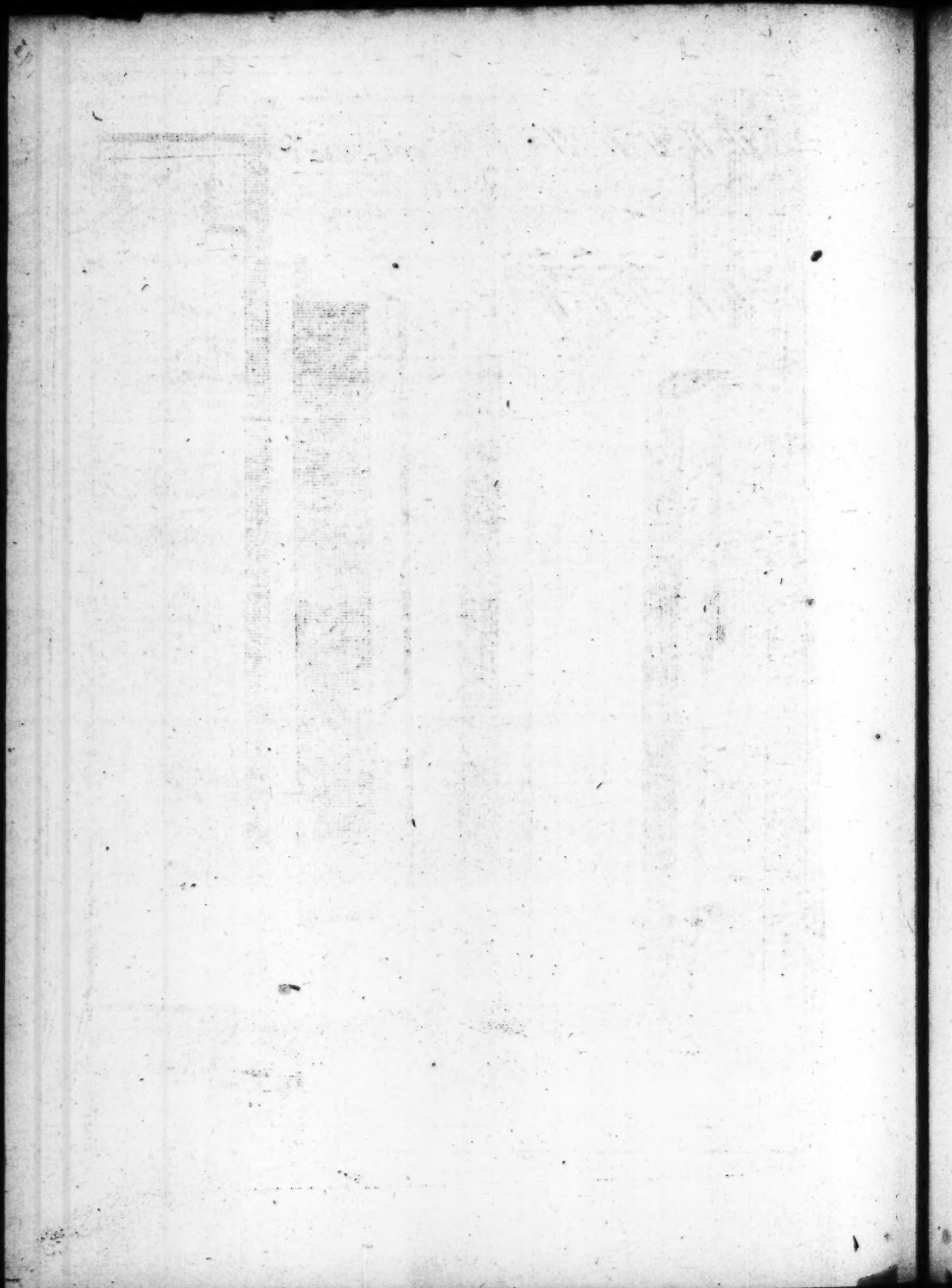
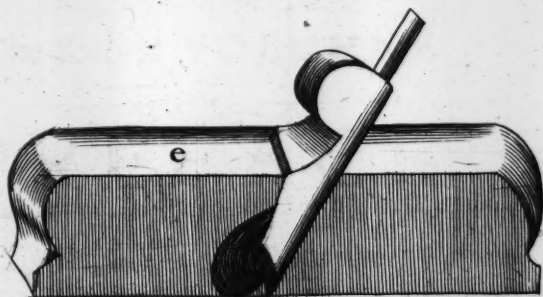
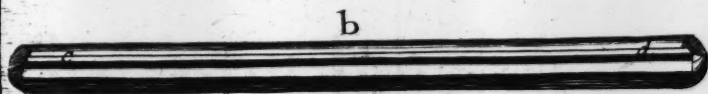
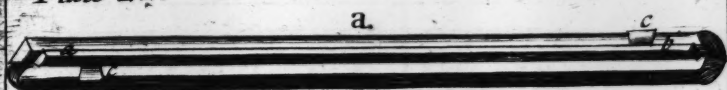
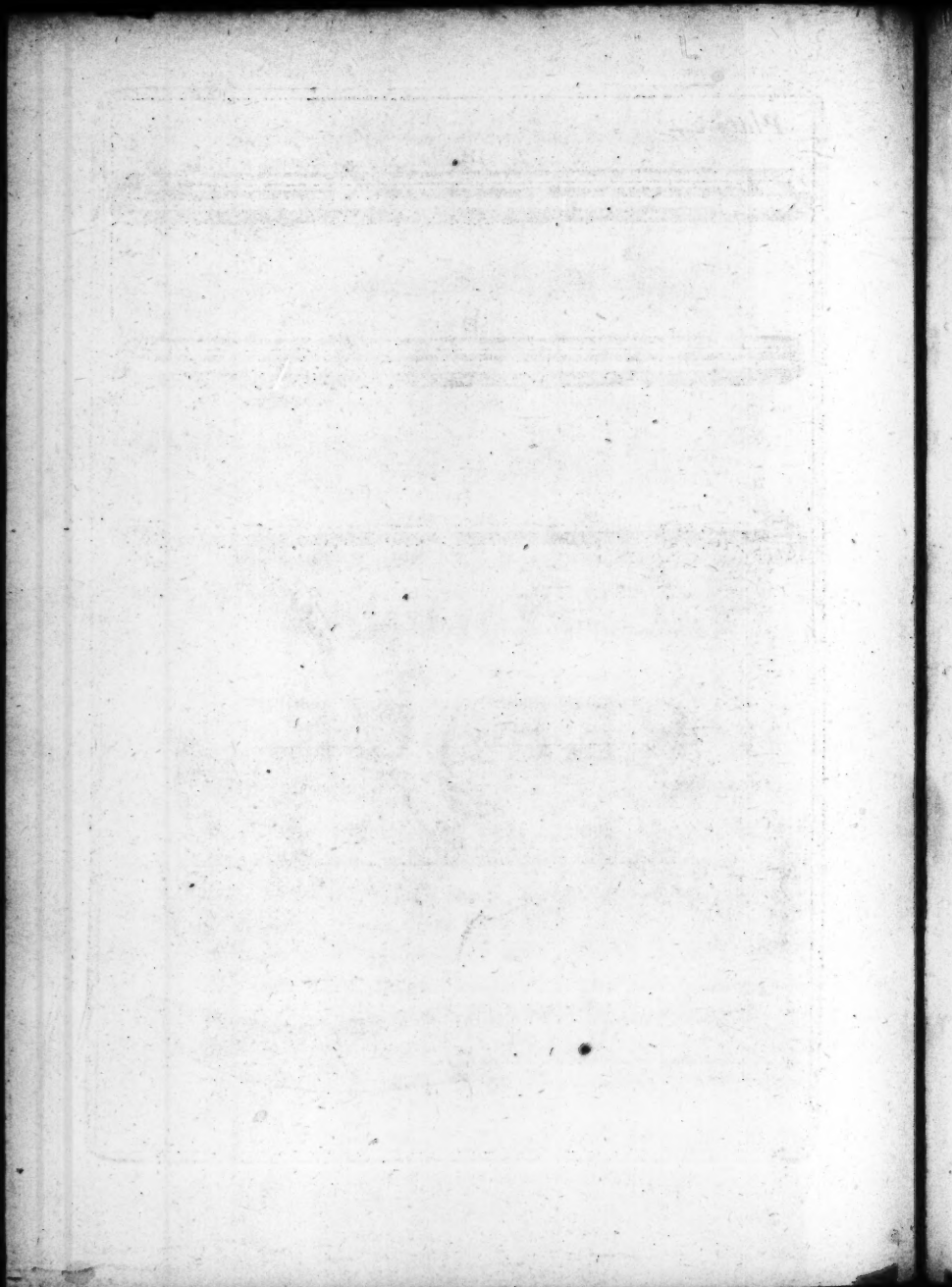


Plate 22.





MECHANICK EXERCISES:

Or, the Doctrine of

Handy-works.

Applied to the

Compositers Trade.

The Second VOLUME

PREFACE.

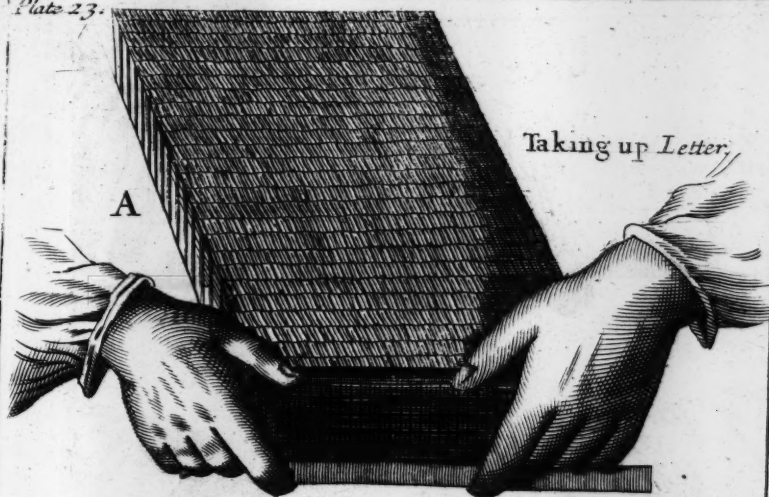
IN a strict sence, a good Compositer need be no more than an English Schöller, or indeed scarce so much; for if he knows but his Letters and Characters he shall meet with in his Printed or Written Copy, and have otherwise a good natural capacity, he may be a better Compositer than another Man whose Education has adorn'd him with Latin, Greek, Hebrew, and other Languages, and shall want a good natural Genius: For by the Laws of Printing, a

E c

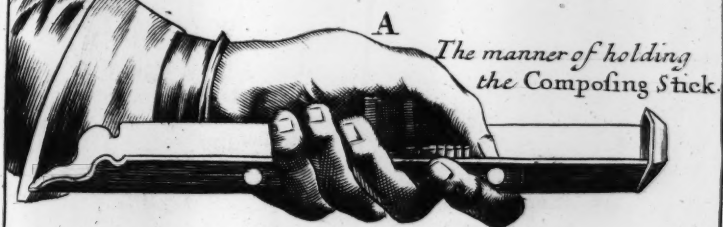
Compositer is strictly to follow his Copy, viz. to observe and do just so much and no more than his Copy will bear him out for; so that his Copy is to be his Rule and Authority: But the carelessness of some good Authors, and the ignorance of other Authors, has forc'd Printers to introduce a Custom, which among them is look'd upon as a task and duty incumbent on the Compositer, viz. to discern and amend the bad Spelling and Pointing of his Copy, if it be English; But if it be in any Forrain Language, the Author is wholly left to his own Skill and Judgement in Spelling and Pointing, &c. his Copy, and Correcting the Prooves, unless they be Latine, Greek or Hebrew, for to those Languages there is generally a Corrector belongs to the Printing-House. And how well other Forrain Languages are Corrected by the Author, we may perceive by the English that is Printed in Forrain Countries.

Therefore upon consideration of these accidental circumstances that attend Copy, it is necessary that a Compositer be a good English Schollar at least; and that he know the present traditional Spelling of all English Words, and that he have so much Sense and Reason, as to Point his Sentences properly: when to begin a Word with a Capital Letter, when (to render the Sense of the Author more intelligent to the Reader) to Set some Words or Sentences in Italic or English Letters, &c. But of this more at large in Chap. 16. of this Treatise.

Thus much of his qualifications: Now to his Task. The Master-Printer gives him his Copy, and directs him to his standing Place or Case, and orders him Letter to Work without Interruption. If his Case want Papering, as all New Cases do, and many times old, He must Paper his Case. §. 22.



58
59



The manner of Emptying
a Stick of Letter.

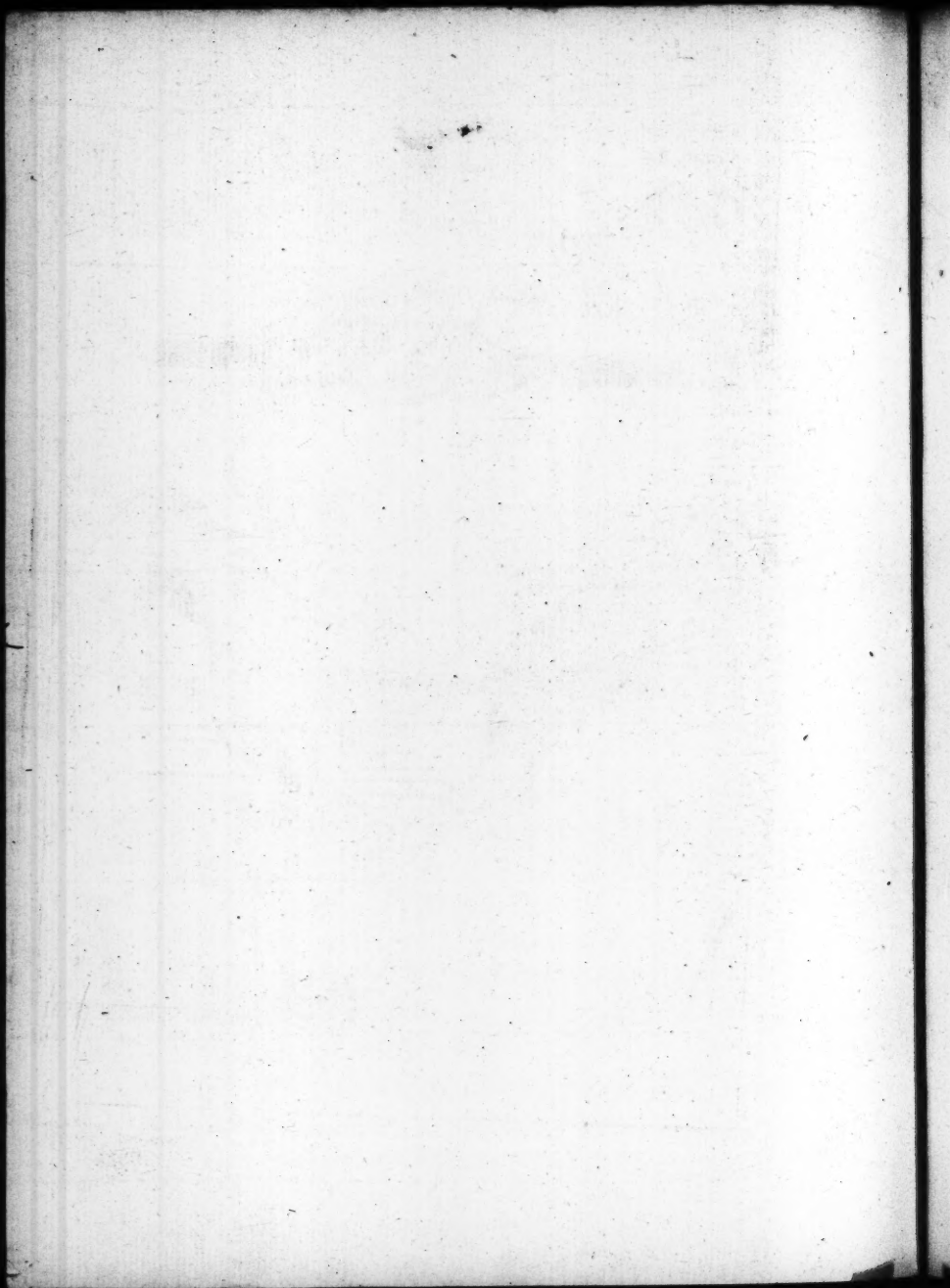
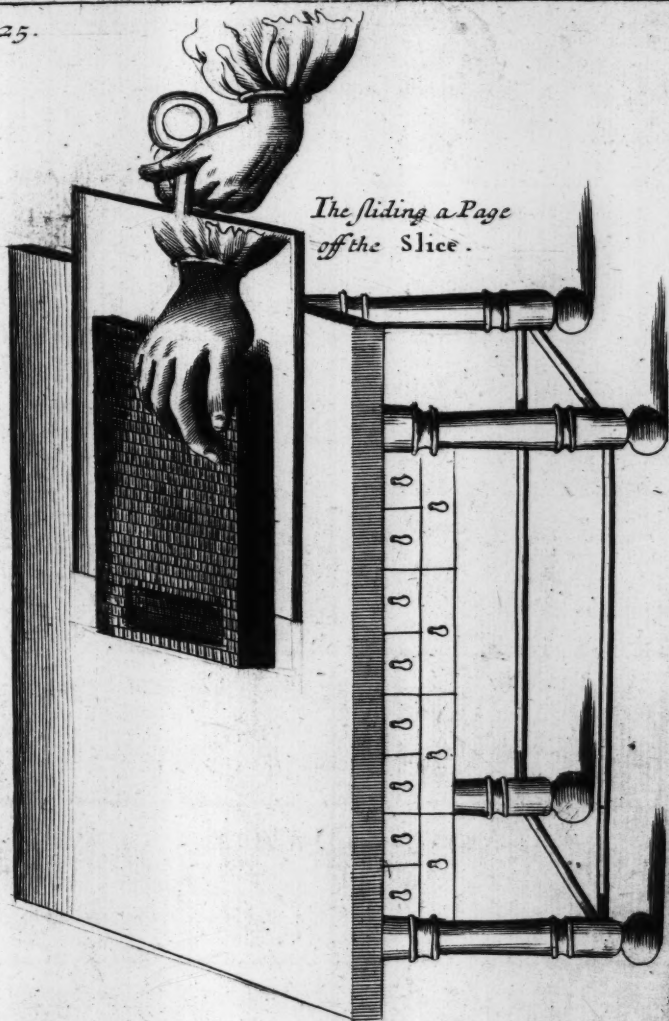


Plate 25.



*The sliding a Page
off the Slice.*

Plate 26.

Imposing a Folio Sheet. *Imposing a Quarto Sheet.*



White Paper Form



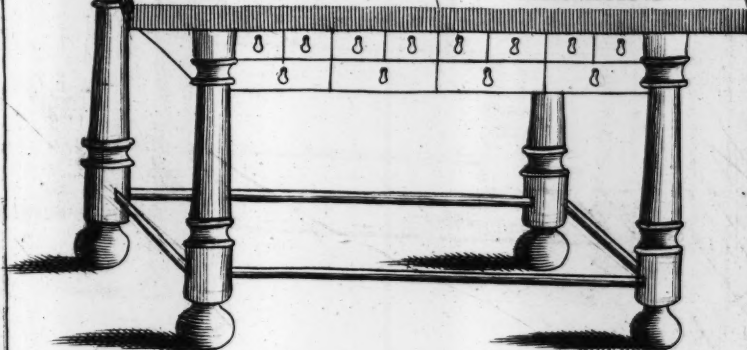
White Paper Form



Reiteration



Reiteration



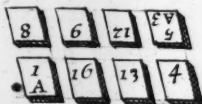
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[Faint, illegible text and markings, possibly bleed-through from the reverse side of the page.]

Plate 27

Imposing an Octavo Sheet.

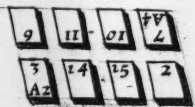


White Paper Form

Imposing a Twelves Sheet.



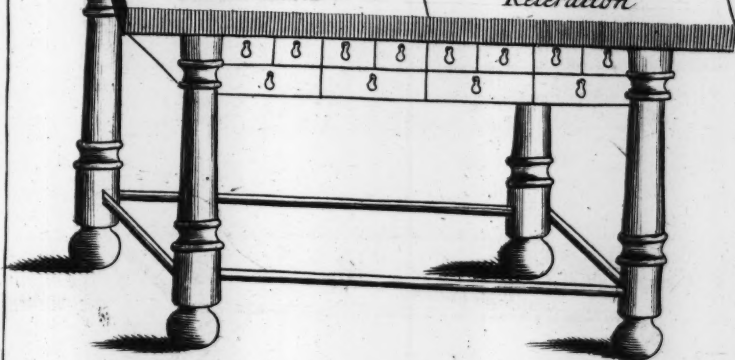
White Paper Form

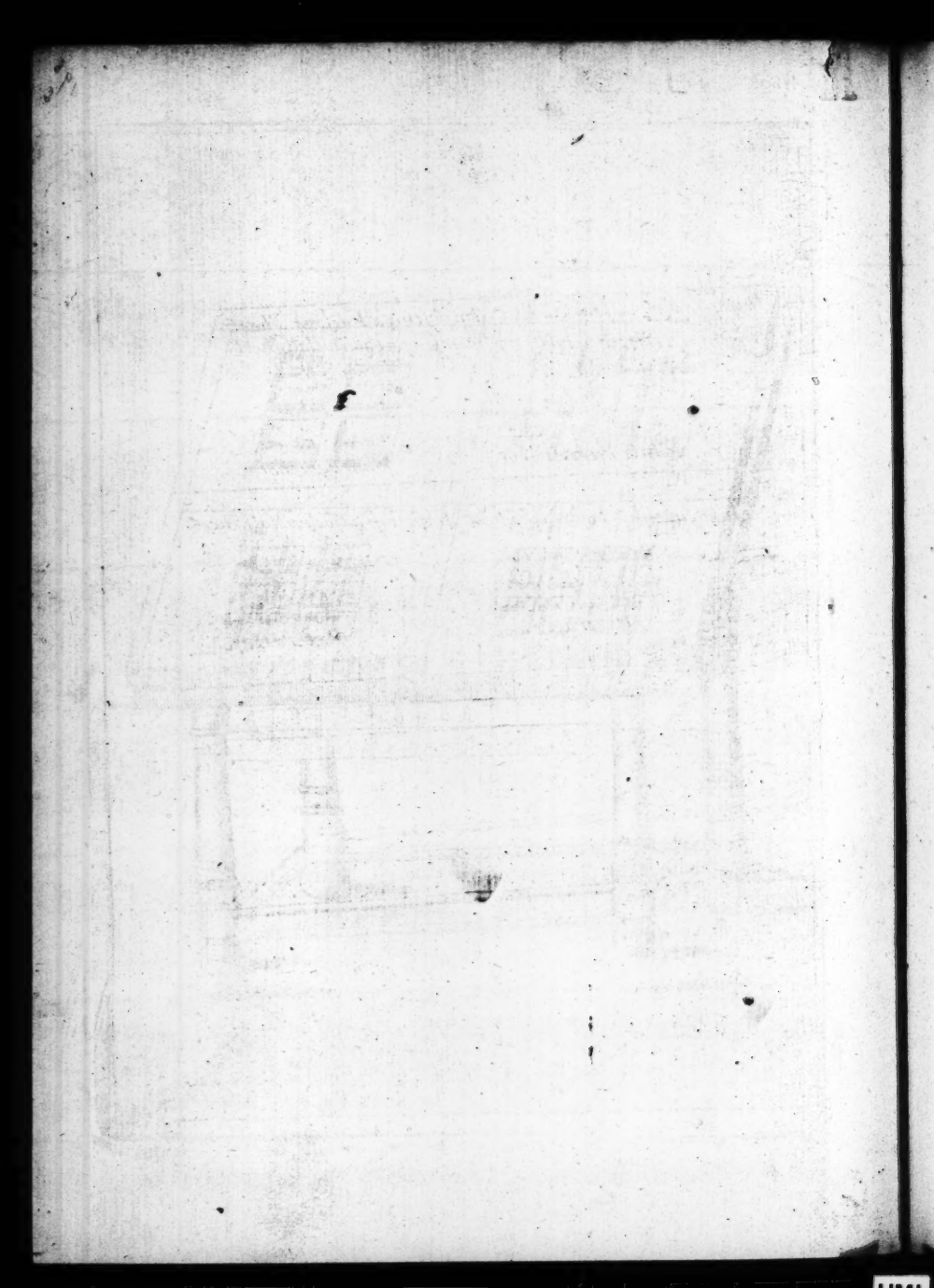


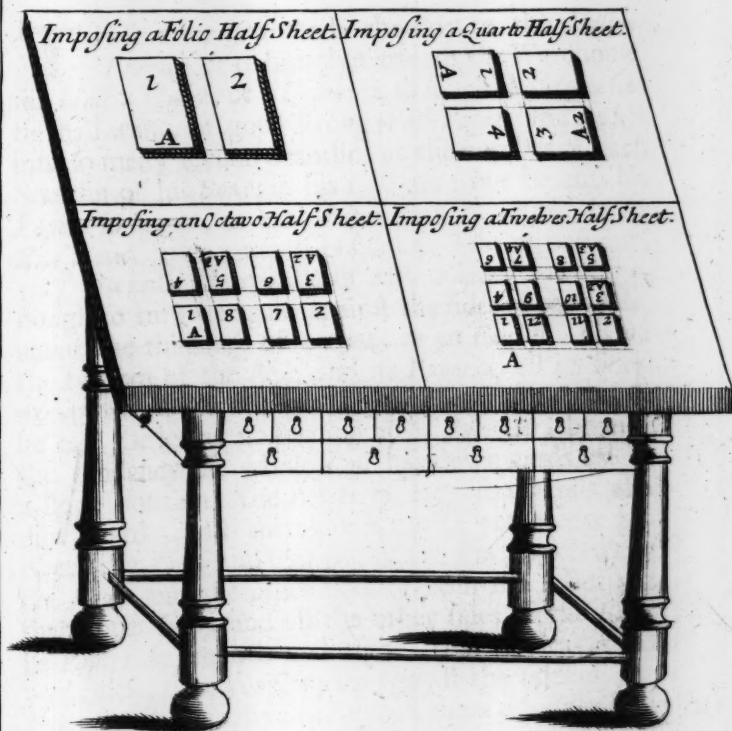
Reteration



Reteration







§. 22. ¶. 1. *Of Papering and Laying the CASE.*

THE *Composster* sends the Boy to the *Master-Printer*, or to him that attends the Warehouse, for *Half a Quire*, or a *Quire*, or so much as he guesse he shall want, of good strong *Wast-Paper*, and cuts it into so many several Scantlins as the number of each Scantlin of his *Boxes* in his *Case* are; but he cuts his *Papers* so large, as each *Paper* may ly double in its *Box*, and have enough besides to fold almost half way towards the middle of each *Paper*, and also enough to turn up again against the sides of each *Box*, about the thickness of a *Pica*, or an *Englisb*, above the bottom of the *Box*; and its *Paper* on all its sides, except the upper side of the *Box*, which, as near as he can, he leaves no turning up of *Paper* to, because the tendency the whole *Case* has downwards by its a-slope position, the *Letter* in each *Box* tends also downwards, and therefore is not so apt to get between the *Paper* and that side of the *Box*, as between the *Paper* and the other sides of each *Box*: But yet that upper side, and all the other sides of the *Box*, he *Papers* so smooth and tight, that he leaves no wrinkles in the turnings up against the sides of the *Box*; but if there be any, drives them carefully into the corners of the *Box*, lest his *Letter*, especially if it be Small, should get into the openings of those

Wrinkles, and in time work their way under the Paper.

Having *Paper'd* his *Cafe*. he considers how the rest of the *Cases* in that *House* ly, viz. into what *Boxes* the several *Letters* are to be disposed; for they are not in every *Printing-House* disposed alike, and accordingly he applies himself to fill his *Cafe* with *Letter*.

If a *Fount* of *New Letter* be brought home from the *Founders*, the *Compositer* has no more to do, but to fill each *Box* in his *Cafe* with so many of each sort as each *Box* will hold, and fall to *Composing* till he has emptied his *Cafe*; which the same way he fills again, and *Composes* on again till the whole *Fount* be *Set up*: But when he has no longer any *New Letter* to work upon, he must *Distribute* some former *Set Forms* to fill his *Cafe* withal.

And before I shew you the Rules and Method of *Distributing* and *Composing*, it will be necessary I say somewhat of the *Cafe*, and *Laying* it.

By the *Cafe* is meant, in *Printers* common dialect, a *Pair of Cases*, viz. the *Upper* and the *Lower-Cafe*: They are described with the most common way of *Laying* them, in Plate 2. A the *Upper Cafe*, B the *Lower Cafe*. The *Upper Cafe* is divided into Ninety eight *Boxes* all of equal size; but the *Lower Cafe* is divided into but Fifty six *Boxes*, and those of four different sizes (as you may see in the Figure) by the Frame and Black streight Lines representing the several Partitions. The manner how the several sorts of *Letters* are disposed in the several *Boxes*, is called, *Laying of the Cafe*, where in the *Upper Cafe* you see
Capital.

Capital A Ly in the uppermost *Box* on the Left hand, B C D E F G succeeding it in that Row to the Right hand, as far as the broad Partition in the middle of the *Cafe*; under *Capital A* lies *Capital H*, I K L M N O orderly succeeding it to the right hand, as far as the great Partition in the middle of the *Cafe*: But the Figure being plain, I refer you to it.

The *Lower Cafe* is not divided according to an orderly succession of the *Alphabet*, in Ranks; for those *Letters* that are most used are laid in the biggest *Boxes*, about the middle of the *Cafe*, That the *Compositors* hand may have the quicker access to them. See the Figure.

¶ 2. Of Rincing a Form of Letter, in order to Distributing it.

After the *Press-man* has *Wash'd a Form*, he brings it to the *Rincing-Trough*, and rears it a little a-slope on one of the ends of the *Chase*, either against a convenient place of the *Frame* of the *Rincing-Trough*, or towards the Wall; for so plac'd, the *Face of the Letter* runs less hazzard of receiving dammage, and the *Form* stands in a proper position for the *Compositer* to rear a *Letter-board* against the backside of it.

The *Compositer* therefore brings a *Letter-board*, and puts the *Face* of it against the back-side of the *Form*, and draws *Form* and *Letter-board* toward him, leaning them against his Knee till he can conveniently grasp about the middle of the sides of the *Chase* and *Letter-board* between his Fingers under the *Board*, and his Thumb upon the *Chase* and *Furniture*: And

if the *Form* be not too heavy, in this position he lifts it up to the *Rincing Trough*; but if it be too heavy, as most commonly it is, He lifts it up in this position till he brings the upper edge of one of the long sides of the *Letter-board* to rest between his Belly and Stomach, and then sets *Letter board Form* and all in the *Rincing Trough*, letting the hither side of the *Board* rest upon the hither Ledge of the *Rincing Trough*, that the *Form* may tilt downwards.

When it is on the *Rincing Trough*, he gets the *Mallet* and *Shooting-stick*, and holding the *Mallet* in his Right hand, and the *Shooting-stick* in his Left, he places the Foot of the *Shooting-stick* (that is the thin end of it) against the narrow ends of each *Quoin*, and knocking with the *Mallet* upon the *Head* of the *Shooting-stick* as gently as he can to drive them back, he loosens every *Quoin*; and this is call'd *Opening of the Quoins*, *Unlocking of the Quoins*, *Opening of the Form*, and *Unlocking of the Form*.

But in the *Unlocking of the Form*, he observes these three Circumstances:

First, He begins at the *Foot-Quoins* of a *Quarter*, and loosens them; then with his Fingers and Thumb he puts them up again pretty stiff; yet not so stiff, but that he can again with his Fingers and Thumb loosen them.

The Reason why he opens the *Foot-Quoins* first, is, because the *Letter* is less subject to *Squabble* between *Line* and *Line* (that is *Head* and *Foot*, the length of the *Page*) than it is between side and side (the breadth of the *Page*): For all the *Letters* of a *Line* being of the same *Body*, are all of the same size in

in their parallel bounds; and the two sides of the *Letter* being generally considerably broader than the Thickness of the *Letter*, are held by their breadth and flatness faster and closer together in a motion towards the *Head* or *Foot* of the *Page*, than they are athwart the *Lines*, there being generally many thin *Letters* and *Spaces* in a *Line*, whose thickness is very little considerable to their *Body* or parallel bounds: So that if the *Form* be loose, those Thin *Letters* and *Spaces* not having a Thickness proportionable to their *Body* to keep them in their proper Square, their Thin Edges twist them about; and one *Letter* very seldom twists alone, but forces many others (perhaps in some *Lines* above and below it, and on each side of it) out of its square position.

But the *Foot-Quoin* being thrust up again with the Fingers, that the *Lines* may joyn again after they were knock'd open with the *Mallet* and *Shooting-stick*, make the Thin *Letters* in the *Lines* less subject to *Squabble* (as not having the room to twist about) because *Opening* the *Foot-Quoins* afterwards with the Fingers, offers less violence than the smart knock of a *Mallet*.

Secondly, He holds the *Shooting-stick* much asslant to the *Letter-board*, so as the *Foot* of it touch not the Face of the *Letter-board*, lest with knocking upon the *Shooting-stick* (it being hard Wood, and the grain running downwards) the *Foot* should batter and spoil the Face of the *Letter-board*.

Thirdly, He *Unlocks* the outermost, viz. the broadest *Quoins* first; and then with his Fingers thrusts them pretty close up again, unless the *Form* he *Un-*

locks

lock be a great *Letter*, for then he observes not this Circumstance so nicely; then the other *Quoin*, or (according to the bigness of the *Form*) *Quoins*.

Having *Unlock'd* the *Foot Quoins*, he *Unlocks* the *Side Quoins* in the same manner and order; and being provided with a Pail, or a great Pan full of fair Water, and a *Wooden Dish*; he takes a Dish full of fair Water, or more, if the *Form* require it, and throws it upon the *Form*, till he have so well wetted it, that the Water may sink between the *Letters* in the *Form*, to hold and keep every *Letter* contiguous to its next.

Then he *Opens* the *Quoins* pretty loose, the *Foot Quoins* first, and in *Opening* them he considers the *Body* of the *Letter*, whether it be Great or Small, and accordingly he *Opens* them; for at the *Foot* he *Opens* them about the thickness of the *Body* of the *Letter*: But on the *Sides* not above half the *Body*.

By *Opening*, you must now understand removing the *Quoins*, till they stand loose, or distant from the *Furniture*, the *Body*, or half the *Body* of the *Letter*.

He *Opens* but one *Quarter* at a time, viz. one of the hithermost *Quarters*, till he have well *Rinc'd* that, which when he has done, with his Fingers he thrusts the *Quoins* of that *Quarter* stiff up again, aswell that it may be the less subject to *Squabble* or *Break*, as that the Water may the better be squeezed out from between the *Letter*; when he comes to *Distribute* it.

Having thus *Opened* the *Quoins*, He also *Opens* the *Furniture*, viz. the *Head sticks*, and the *Inner Side-sticks* and *Gutter-sticks*, if the *Form* have any, to make himself the more room to *Open* the *Letter*: The Balls of the three first Fingers of each Hand he places
near

near the ends of the *Head-stick*, and *Opens* it by taking as good hold as he can of so much of it as stands above the *Cross* of the *Chase*, drawing the *Head-stick* towards him about half the *Body* of the *Letter*. And in the like manner he *Opens* the inner *Side-sticks*, but draws them towards him about a quarter of the *Body* of the *Letter*. Yet sometimes this Office is not perform'd with the three Fore-fingers of each Hand, but with the two Thumbs; and this is when the *Quarter* of *Letter* stands between the *Head* or *Side-sticks*, and then he places his two Thumbs near the ends of the *Sticks*, as before he did his Fingers, and thrusts the *Sticks*, *Letter* and all, from him.

And having *Opened* the *Quoins* and *Furniture* of one *Quarter*, he also *Opens* the *Letter*, that it may receive the *Water* more plentifully: He *Opens* the *Letter*, by fixing the *Balls* of his *Fingers* of both his *Hands* upon the *Face*, and so thrusting and joggling it from him, and drawing it towards him from *Head* to *Foot*, and from *Side* to *Side*, and then throws a good *Dish* full or two of *Water* upon it, and with the *Balls* of his *Fingers* still rubs upon the *Face* of the *Letter*, that by shaking and joggling the *Letter*, the *Water* (e're it sink through the *Letter*) may the better *Rince* away that *Ly* that by the *Pressmans* washing soak'd into it: And this joggling the *Letter*, and throwing on fresh *Water* he continues till the *Water* that spurts out from between the *Letters* by this joggling, be as clear as it was when it was thrown on, and then, and not till then, he knows his *Quarter* is well *Rinc'd*: Then with his two *Thumbs*, one

F f

placed

placed on the side of the *Foot-stick* and the other on the side of the *Side-stick*, as near as he can, he thrusts both at once towards their opposite *Cross*s, and so thrusts the *Letter* and *Furniture* close up again: And that the *Letter* may not be in danger of *Squabbling* or *Breaking*, he thrusts the *Quoins* loosely up again, also.

As he *Open'd* and *Rinc'd* this first *Quarter*, he *Opens* and *Rinces* the others.

The reason why he *Opens* and *Rinces* the hithermost *Quarter* first, is, because the Water that descends from the hithermost *Quarters* does in a degree help to *Rince* the nethermost also.

Having thus *Rinc'd* the whole *Form*, and with his Fingers shut it up again, he lets it stand a little while to drain; then grasping the two ends of the *Letter-board* a little beyond the middle, with his Fingers underneath, and the Thumb-balls of his two Hands upon it, he sets one side of the *Letter-board* against the bottom of his Stomach, and carries *Letter-board, Form*, and all to the *Distributing Frame*.

Then he falls to *Stripping* of one *Quarter* first: Taking the *Quoins* quite out, and laying them upon the *Face* of the *Letter*, either on the same or another *Quarter* (if he *Strips* but one *Quarter* at once) with their ends standing the same way they stood in the *Chase*, and in the same order of succession; then he removes the *Side* and *Foot-sticks* to their respective sides, close to the inside of the *Chase*, and again removes the *Quoins*, laying them in the same order he laid them upon the *Face* of the *Letter*, upon the upper sides of the *Side* and *Foot-sticks*, and *Chase*;
then

then, as I told you before, how he *Opened* the *Inner Side-sticks*, just so again he not only opens them, but by the *Side* and *Head-sticks* he draws or slides the *Letter* from the *Crosses*, that he easily takes them out if he pleases; or if he have room enough to come at the *Letter* without, he lets them stay in.

Thus the first *Quarter* is *Stript*, and so the other *Quarters* successively, in order to be *Destributed*.

¶ 3. Of *Destributing*.

The *Compositer* seeks among the *Furniture* for a *Riglet*, a little longer (about a *Pica* or *English*) than the *Line* of the *Page* he is to *Destribute*; or else he cuts a *Riglet* to that length (this *Riglet* is called a *Destributing-stick*) and coming to his *Stript Form*, or *Quarter* of the *Form* he is to *Destribute*, he places one flat side of the *Riglet* against the *Head* of the *Page*, and claps the *Balls* of his two *Fore-fingers* behind it, and the *inner Joints* (next his *Fore-fingers*) of his *middle Fingers* he claps against the ends of so many *Lines* as he intends to *Take up*, supposing it *Pica*, about *Seven*; and presses them pretty close to the sides of the *Lines*: Then with the ends of the *Balls* of his two *Thumbs* he parts that number of *Lines* from the rest of the *Page*, by pressing gently towards his *Riglet* or *Destributing-stick* upon the *Face* of the *Letter* of the farthest *Line*, which, if the *Joints* of his *middle Fingers* press pretty hard towards each other at first, easily part, and he may open that number of *Lines* so far from the rest of the *Page*, that he may get the *Balls* of his *Thumbs*

far enough upon the Shank of the *Letter*: So that the pressing the *Lines* yet a little harder between the Joints of his middle Fingers, and pinching with his Thumbs the *Letter* hard against the *Riglet*, with a quick jerk he rears that *Taking-up* upon his *Distributing-stick*. See Plate 23. at A.

Having it upon his *Distributing-stick* between both his Hands, with the *Face* of the *Letter* from him, he disengages his middle Fingers, and with his fore Fingers and Thumbs holding the *Riglet*, and now the Top of his *Taking-up* pretty loosely between them, he turns (as on two moving *Axises*) the ends of the *Lines* that were towards his *Right Hand*, and guides them to the Thumb-ball of his *Left Hand*: Thus the *Face* of the *Letter* is turn'd towards him; then bowing the inner Joynt of the middle Finger of his *Left Hand* (which before prest the left side of the *Line*) under the middle of the *Riglet* he takes the weight of the *Taking-up* upon it, which yet he eases as he lifts, by mounting the now *Right Hand* end of the *Lines* a little above an *Horizontal* level, and depressing the *Left Hand* ends a little below; so that now he has his *Taking up* in his Hand, with the *Face* of his *Letter* towards him, and the *Notches* upwards, he goes with it to his *Cafe*, and places himself against the middle of it. See Plate 23. at B.

Then clapping the Ball (or if he will take off more than the length of the Ball) of his middle Finger of his *Right Hand*, of the second Joint of that finger, against the bottom of the uppermost *Line* of his *Taking up* towards his *Right Hand*, and his fore Finger about the middle of the Shank of the *Letter*,
he

he slides or draws towards him about an Inch or an Inch and an half of that *Line* upon the Ball of his Thumb, which is placed at the *Face* of the *Letter* to receive it : And as it comes off the *Taking up*, he with his aforesaid two Fingers and Thumb disposes it so among his Fingers that he gathers the Ball of his fourth Finger under the bottom of the *Letter*, and then he brings what he has taken off towards his Sight to read ; then with a sleight thrusting the Ball of his Thumb outwards, and drawing inwards the Balls of his fore and middle Fingers, he spreads and *Squabbles* the shanks of the *Letters* between his Fingers askew ; and remembring what *Letters* he read, he nimbly addresses his Hand with a continued motion to every respective *Box*, which his Fingers, as they pass by, lets a *Letter* drop into, till his *Taking off* be quite *Destributed*.

Having *Destributed* that *Taking off* he makes another *Taking off* as before, and so continues his *Takings off* till his whole *Taking up* be *Distributed* : And thus he *Takes up* and *Destributes* till his *Cafe* is full.

If the *Form* were not well *Rinc'd*, the shanks of the *Letters* will be more or less slippery, and with long *Destributing* will make the Balls of the Fingers and Thumb supple, by the wetness of the *Letter* and sharpness of the *Ly* ; and consequently the grain of the skin will be made clumsy, and those Joints feeble ; so that they will not so well fasten upon the sides of the Shank to command the *Letter*, and draw it askew, or be so nimble at disposing them into their several *Boxes*.

This

This happens most if they work upon small *Letter*, and that old, and the *Ly* old too, for then the *Ly* will have much *Inck* mingled in it: And the *Compositer* will have much ado to *Rince* his *Form* so clean but that the *Letter* will be slippery, and consequently not spread, as aforesaid. But against it they may use a remedy, which is, to have a piece of Allom about the bigness of a Hasel-nut, lye in one of the *Boxes* of the *Cafe*; for by feeling that now and then, the dilated pores of their *Fingers* are again contracted, and fit to do their office: For by the greasiness of the *Letter*, the grain of the *Skin* of the *Fingers* were so dilated, that the *Compositer* could not so actively draw the *Shanks* of the *Letters* askew, as aforesaid.

The *Compositer*, if conveniences suit, chuses to *Destribute* his *Letter* over Night, that he may have a *dry Cafe* (as he calls it) to work at in the Morning, because *Wet Letters* are not so ready and pleasant to pick up as *Dry*; and besides are apt to make the *Fingers* sore, especially if the *Ly* be not so well *Rinc'd* from the *Letter* as it should be. In the Winter, when he *Destributes* in the Day time, he commonly brings the *Lower Cafe*, when full of *Letter*, to the Fire to dry, rearing the farther side of the *Cafe* a little upwards: And when it is well dried, he sets it again upon the *Frame*.

¶ 4. Of Composing.

The *Compositer* now addresses himself to *Composing* : And looking a little over his *Copy*, to see how it pleases him, for he runs different fortunes, either of good or bad *Copy*, viz. well or ill writ, if it be a *Written Copy*, or much *Italick*, *Latin* or *Greek*, or *Marginal Notes*, or few *Breaks*, &c. for this he likes not in his *Copy* : But a *Printed Copy*, or a fair *Written Hand*, and full of *Breaks* pleases him well, and is by *Compositers* call'd *Good Copy*, *Light*, *Easie Work* ; when the former they call *Bad*, *Heavy*, *Hard Work* : And if a Price be already made for a whole Book, the Good and Bad is done at the same Price.

If the *Measure* be already made, that is, if he was already upon that *Work* before, and his *Composing-stick* be set to the *Measure* of that *Work*, he needs not, or must nor alter his *Composing-stick* : But if his *Measure* be not made, he must unskrew the *Skrew* of his *Composing-stick*, and slide the *Cheeks* nearer to, or farther off the *Head* of his *Composing-stick*, till he have exactly fitted his given *Measure*.

If it be a *Printed Copy* he is to *Work* on, and his *Work* must run *Line for Line* with his *Copy*, he then without more ado, *Sets* or *Composes* the fullest *Line* he finds in his *Copy*, and slides up the *Cheeks* of his *Composing-stick*, and pinches that *Line* between the *Cheeks* and the *Head*, till it stands as stiff or hard in the *Stick* as he intends to *Justifie* all the rest of his *Lines* : Then screws up the *Composing-stick*.

Justi-

Justifying (in *Compositers* Language) is the stiff or loose filling of his *Stick*, for if it be fill'd very stiff with *Letters* or *Spaces*, they say it is *hard Justified*, if loosely, they say it is *loose Justified*.

Having the *Measure* fitted, he places the *Galley* on his *Upper Case* on the Right Hand, for those *Boxes* are seldome used, because in them are placed only the *Latin sorts*, or sometimes the *Small Capitals*, *Astronomical Signs*, &c.

He places his *Galley* so, that the Left Hand corner of the bottom of its *Frame* stands lower upon the *Case* than any of the other Corners, for in that position the *Letters* at the end of every *Line* stand safest from falling, as leaning towards the rest of the *Page*.

Some *Compositers* use *Visorums*, as is described in *Plate 2.* at i. Therefore pricking the point of the *Visorum* most commonly upon the *Border* or *Frame* of the *Case* on the Left Hand about the *G-Box*, they fold the *Leaf* of *Copy* they *Compose* by, so as the bottom of it may rest upon the *Square-Shoulder* near the bottom of the *Visorum*; then with two pieces of *Scaboard* tyed together at one end, they clasp both the *Copy* and *Visorum* between these two *Scaboards*, which two *Scaboards* pinch the *Copy* and *Visorum* fast enough to keep the *Copy* in its place, and at the same time also serves for an *Index* to direct the Eye to every *Line*, as the *Compositer* moves it downward.

After this preparation, the *Compositer* falls to *Composing*. But first reads so much of his *Copy* as he thinks he can retain in his memory till he have *Composed* it, as commonly is five or six words, or sometimes a longer Sentence. And having read, he
falls

falls a Spelling in his mind ; yet so, that his Thoughts run no faster than his Fingers: For as he spells A, he takes up A out of the A Box, as he names n in his thoughts, he takes up n out of the n Box, as he names d in his thoughts he takes up d out of the d Box ; which three *Letters* set together make a Word, viz. And ; so that after the d he sets a *Space* : Then he goes on to the next *Word*, and so *Composes* on, *Setting* a *Space* after every *Word* till the *Words* come to the end of the *Line*, for then he sets no *Space*.

When he *Composes* the *Letters* he holds the *Composing-stick* in his Left Hand, placing the Second Joynt of his Thumb over the moving *Cheek* of the *Stick*, and the end of the Ball of his Thumb reaches down to the bottom of the *Cheek* and *Stick* ; so that with the end of the Ball of his Thumb he gently presses the *Letter* close to the *Cheek*, and keeps the *Letters* tight and square together, as he places them in the *Stick* successively. See Plate 24. at A.

And as his Eyes are very quick in reading his *Copy*, and in shifting its Visual Ray to the several *Boxes* he is to have a *Letter* out of, so is his choice what *Letter* to take up very sudden ; for though the *Box* be full of *Letters*, yet in an instant he resolves and pitches his Fingers upon that one, which for its posture and position his Fancy reckons lyes most commodious for his immediate seizing. For position, he generally chuses that which lies uppermost, because it is readiest at Hand to snatch up : And for posture, that which lies with its *Face* towards his Right Hand, because catching at the *Letter* near the *Face*-end of the *Shank*, he by an accustomed sleight, in his Fingers

G g

while

while it is coming to the *Stick*, disposes it so, that as the bottom of the Shank goes directly forwards, towards the bottom of the *Stick*, so the *Notch* of the *Letter* shall also be placed upwards.

Most *Compositers* use a *Composing-Rule*, which is only a piece of a *Brass-Rule* cut to the length of the *Measure*, with a small *Ear* left at either end, to take it out by, when the *Line* is full, and to lay it upon the *Compos'd Line*, to *Set* successively a succession of *Lines* upon, till the *Stick* be full.

This *Rule* is very commodious to Work with, because the *Letter* slides easier and smother down to the *Back* of the *Stick*, than it will upon a *Line* of *Letters*: Besides, the *Letters Compos'd* on it stand straighter and truer in *Line*, and are less subject to *Hang*, than those *Compos'd* on a *Line* of *Matter*; unless with a *Riglet* (as that they many times do) they rub pretty strongly along the *Line* they have *Compos'd*, which is a labour more than needs, and the loss of some time to make the Work more unpleasant.

Having *Compos'd* one *Line*, if it ends with a *Word* or a *Syllable* and a *Division*, and just fill the *Measure*, it needs no more *Justifying*; but if the *Line* conclude not as aforesaid, then he puts a *Space* more between every *Word*, or so many *Words* as will fill up the *Measure* pretty stiff, viz. *Justifie* the *Line*. But if the *Line* be not yet *Justified*, he puts another *Space* between every *Word*, or between several *Words*, till the *Line* be *Justified*: So that here is now three *Spaces*, and strictly, good Workmanship will not allow more, unless the *Measure* be so short, that by reason

reason of few *Words* in a *Line*, necessity compells him to put more *Spaces* between the *Words*. This often happens in *Marginal Notes*, where the *White* between *Words* is often as great or greater than between *Line* and *Line*.

These wide *Whites* are by *Compositors* (in way of Scandal) call'd *Pidgeon-holes*, and are by none accounted good Workmanship, unless in such cases of necessity, as aforesaid.

And as *Lines* may be too much *Spaced-out*, so may they be too close *Set*: It may be accounted too close *Set* when only a *Thin-space* is set between *Words*, especially if no *Capital Letter* follows the *Thin-space* or *Point* go before it. *Thin-spaces* being intended and *Cast* only that the *Compositer* may *Justifie* his *Lines* the *Truer*, and not to serve for convenient distinction between *Words*; yet do some *Compositors* too often commit this error, rather than put themselves to the trouble of *Spacing* out a *Line*, where many *Spaces* must be used to *Space* it out.

A good *Compositer* takes care not to *Set* too Close, or too Wide; for if he *Set* too Close, and should happen to leave out a *Word* or two, it will give him a great deal of trouble to get those *Words* in; Nay perhaps when he comes to a *Break* he drives out a *Line*, for which *Line* perchance he may be forc'd to *Over-run* all the *Pages* that are *Set* forwards upon that *Matter*. And if he *Sets* too Wide, and he chance to *Set* a *Word* or two twice over, he may be forc'd to make *Pidgeon-holes* ere he come to a *Break*, and then perhaps his *Break* is got in too, and his *Page* a *Line* too short, and he forc'd to *Over-run* several

ral Pages ere he can drive that *Line* out. As I shall farther shew you when I come to the ¶ of *Correcting*.

In *Justifying* his *Line* he takes great care that it do not *Hang*: It is an unproper Term, yet grown into Use, for when the *Letter* stands askew, and not directly Square, they say it *Hangs*. New *Letter* is most subject to *Hang*, especially if not very smoothly *Drest*; Because the least Bur, or sharpness of its Angles, may catch in the Burs or Angles of the *Letters* that stand next them, and so make them stand aslope, and one *Letter* standing aslope is very subject to make all the other *Letters* in that *Line* stand aslope too. Therefore if he find his *Letter Hang*, while his *Line* is yet loose, viz. Unjustified, he gently with the Ball of the Thumb of his Left Hand, thrusts the top of the shank of the *Line* where it *Hangs*, moving the *Letter* somewhat from him, towards the farther end of the *Stick*, and with the Balls of the two Fore-fingers of his Right Hand pats upon the *Face* of the *Letter*, till he have got them into an upright position. He moves or drives the top of the Shank of the *Letter* from him, because generally the placing the Ball of his Thumb on the top of the shank of the *Letter* when he *Composes* (as was shewn before) is subject to draw the *Letter* askew towards him, but that his care commonly prevents it: Yet if by chance the *Line* should *Hang* from him, then he with the Ball of his Thumb as aforesaid, draws the *Letter* towards him, to set it upright.

Here

Here is now one *Line Compos'd* : And as he *Compos'd* that *Line*, so he *Composes Line* upon *Line* till his *Stick* be full : When his *Stick* is full, he *Empties* thus ; He lays his *Stick* down upon his *Lower Case*, with the bottom of his *Stick* against the hither *Ledge* of the *Case*, and the *Face* of the *Letter* upwards ; being provided of a *Riglet* just the Length of his *Line*, he lays his *Riglet* against his last *Line*, and places the Balls of his two Fore-fingers behind the *Riglet*, near the middle of it, if the *Line* be not too long, and then only as near the middle as he can to command it with his Fore-fingers ; and he places the Balls of his Thumbs against the first *Line* in his *Stick* as far below the *Face* of the *Letter* as he can, and he places first the Joints of his middle-fingers against the Sides of the *Letter* at the two ends of the *Line*, so as I shewed you he did when he was *Taking up* his *Letter* to *Distribute* it ; and in this posture pinching the *Letter* between his Thumbs and his Fore-fingers, and and squeezing his two middle fingers towards each other, he leans the *Letter* in the *Stick* almost flat upon the *Riglet* : But if his *Lines* were *Hard Justified*, he cannot perhaps with the first leaning the *Letter* back get them clear out of the *Stick*, therefore he again wriggles the *Stick* of *Letter* forwards and backwards, till he gets them quite out. See Plate 24. at B.

Having gotten them out, and in this posture fast between his Thumbs and Fingers, and the *Letter* leaning almost flat upon his *Riglet*, he directs both his hands together to his *Galley*, and nimbly claps that *Stick* of *Letter* down into the *Galley* ; placing the

first *Line* close and upright against the lower ledge of the *Galley*, and the beginning of his *Lines* close and upright against the left hand *Ledge* of the *Galley*, and then disengages his *Fingers* and *Thumbs*, and leaves his *Riglet* standing in its place till he have occasion to use it in like manner for the next *Stick* of *Letter*.

As he *Set* this *Stick* of *Letter*, so he *Sets* on till his *Page* is *Out*, Remembring after the last *Line* of every *Page* to set a *Direction*: That is, he *Sets* a *Line* of *Quadrats* and at the end of it the first word of the next *Page*, or if the Word be very long and the *Line* very short, two *Syllables*, or sometimes but one of that *Word*. And if it be the *First Page*, viz. the first *Page* of that *Sheet*, he *Sets* a *Signature* about the middle of the *Line*, or rather a small matter nearer the end than the middle is, (because when the *Sheets* are wrought off and gather'd, they *Collation* something quicker: The *Collationer* not being forced to prick up with his *Bodkin* the corners of the *Sheet* so high to see the *Signature*: which in a long train of work saves time.

If it be the *First Page* of the first *Sheet* of a *Book* the *Signature* is *A*, if the first of the second *Sheet* *B*, if the first of the third *C*, and so successively till he come to *W*, which is always skipt, because the *Latin Alphabet* has not that *Letter* in it; but next *V* follows *XYZ*, so that if the *Book* contain above three and twenty *Sheets*, the *Signature* of the four and twentieth *Sheet* must be *A a*, if five and twenty *B b*; till in like manner he run through the *Second Alphabet*, and comes to the third, fourth, &c. still as he begins a new *Alphabet* adding an *a*.

To

To the second *Page*, or any other *Even Page*, he *Sets* no *Signature*, but to the Third which is an *Odd Page* he does, viz. A 2. The *Figure* of 2 is no part of the *Signature*, but is only an adjunct to shew the *Book-binder* the Second *Leaf* of that *Sheet*, that he may the surer *Fold* the *Sheet* right.

If it be a *Folio Sheet* he cannot set A 3 in a single *Sheet*, because it has but two *Odd Pages* in it; but if they be *Quir'd Sheets*, that is, two, three, or four *Sheets Quir'd* together, he must set A 3 in a *Folio*, though not in the First, but Third *Sheet* of that *Quire*. But no wise *Compositer*, except he work on *Printed Copy* that runs *Sheet* for *Sheet*, will be willing to *Compose* more *Sheets* to a *Quire* than he shall have a *Fount* of *Letter* large enough to set out, unless he will take upon him the trouble of *Counting* off his *Copy*: because he cannot *Impose* till he has *Set* to the last *Page* of that *Quire*; all the other *Sheets* being *Quired* within the first *Sheet*, and the last *Page* of the *Quire* comes in the first *Sheet*. But when he *Composes Quir'd Work*, the *Signature* of the first *Page* is A, the *Signature* of the *Sheet Quir'd* next within the first *Sheet* is A 2, the first *Page* of the next *Quir'd Sheet* A 3: So that the *Signatures* of all the *Sheets* in the first *Quire* is A, A 2, A 3, &c. according to the number of *Sheets Quired* together. The second *Quire* begins B, B 2, B 3, &c. The Third *Sheet* C, &c. according to the number of *Quires*. This is called *Printing* in *Quires*. Now to return.

If the *Form* be *Quarto*, he *Sets* under the Fifth *Page Signature* 3. If *Octavo*, he sets also under the Fifth *Page Signature* 3. and under the Seventh *Page*

Signa-

Signature 4. If *Twelves*, he sets also under the *Fifth Page Signature 3*, and under the *Seventh Page Signature 4*, and under the *Ninth Page Signature 5*, and under the *Eleventh Page Signature 6*. The Rule is, that all *Odd Pages* should have a *Signature*, if they stand on the *Out-side* of the *Sheet*; and the reason for the Rule is, that the *Gatherer*, *Collater* and *Book-binder* may the readier lay *Sheets* right, if they be turned wrong. This Rule is not among *Compositers* so well observed as it ought to be: For in *Quarto's* they not only leave the *Signature 4* out, but rarely put in *Signature 3*.

¶ 5. *Some Circumstances a good Compositer considers and observes in Composing.*

A good *Compositer* is ambitious as well to make the meaning of his *Author* intelligent to the *Reader*, as to make his Work shew graceful to the *Eye*, and pleasant in Reading: Therefore if his *Copy* be Written in a Language he understands, he reads his *Copy* with consideration; that so he may get himself into the meaning of the *Author*, and consequently considers how to order his Work the better both in the *Title Page*, and in the matter of the *Book*: As how to make his *Indenting*, *Pointing*, *Breaking*, *Italicking*, &c. the better sympathize with the *Authors* Genius, and also with the capacity of the *Reader*.

Nor does a *Compositer* the least shew his skill in the well ordering and humouring of a *Title Page*, which, because it is the first *Page* of a *Book*, we shall begin the *Compositers* Considerations at.

He

He, as aforefaid, judiciously reads his *Title Page*, and considers what *Word* or *Words* have the greatest Emphasis in it. If many *Words* precede the Emphasis, he considers whether it be best to make one or two *Lines*, or more of them, by electing a *Body* bigger or less to *Set* the precedent *Matter* in, and whether any of these *Lines* ought to be *Indented*, either at one end or both, viz. *Set* in the middle of the *Line*. And what *Words* of Emphasis come in that precedent *Matter*; that he may *Set* them either in *Capitals*, *Roman*, *Italick*, or *English*; and at last bring the great Emphasis, which is generally the *Title* or *Name* of the *Book* in a *Line* by it self, and just fill it if he can; which he has some helps to do, by the great *Bodied Letters* of the *Lower Case*, or else by *Capitals*, *Roman*, *Italick* or *English*, of a proper *Body*, which best pleases his fancy, or is in present mode.

If this *Word* of great Emphasis be *Set* in the *Lower Case*, yet he *Sets* the first *Letter* a *Capital*, and he *Sets* no *Space* between *Letter* and *Letter*, but between *Word* and *Word* he does, if there happens more than one *Word* in that *Line*: But if that *Word* be *Set* in *Capitals*, he chuses to *Set* a *Space* between every *Letter*, and sometimes he *Sets* two *Spaces*, yet that is rather to drive out the *Line*.

If he *Sets* but one *Space* between the *Letters* in a *Word*, he *Sets* three *Spaces* between *Word* and *Word*: And if he *Set* two *Spaces* between *Letter* and *Letter*, he *Sets* four *Spaces* between *Word* and *Word*, as well to give a graceful appearance to the *Eye*, as to make a *Visible* and proportionable distinction between *Word* and *Word*.

H h

He

He also considers what *Whites* to *Set* between his *Lines*; as either a *Line* of *Quadrats*, and of what *Body*; or (if his *Title Page* be large) but a *Scaboard*; and at last *Justifies* his *Page* in *Length*, either by adding more *Whites* (where they may be proper) if his *Page* be too short, or by taking out or diminishing *Whites* if the *Page* be too long: And this he does by altering the *Body* of *Whites*, for if a *White-line* be *English*, he may take it out, and in its room put in *Pica*, *Long-primmer* or *Brevier*, according as he finds he has *Run out*; yet this he does with Consideration, where more or less *White* is properest.

But the mode of ordering *Titles* varies; as may be seen by comparing the *Title Pages* of every twenty years: Therefore a Lasting Rule cannot be given for the ordering them: only what has been said in general concerning Emphasis, and in particular to humour the Eye, the *Compositer* has a constant regard to.

When he is to Work upon a continued Series of *Matter*, he *Sets* the *Title* of the *Chapter* or *Section* in a bigger *Body* and different Character than his *Matter* is *Set* in; as if the *Matter* be *Set* in *English Roman*, he *Sets* the *Title* in *Great Primer* or *Double Pica Italic*, but the *Words* of *Emphasis* he will *Set* in *Roman*, and varies the Character for them as well in the *Title*, as he does in the *Matter*.

If his *Title* be short, he *Sets* it in the middle of the *Line*, by *Setting Quadrats* on both sides: If his *Title* be long, he *Sets* the middle *Line* in the middle: If it make three or more *Lines*, he *Indents* the first with an *m Quadrat*, and the other with two *m Qua-*

m *Quadrats*. Before his *Title* he sets a *White-line*, viz. a *Line* of *Quadrats*, and so he does after it ; but with regard to what the bigness of the *Body* of the *Letter* the *Title* is *Set* in, *Runs out* ; for these *Whites* must be set of such *Bodies* (bigger or less) as will make the difference of the *Body* the *Title* is *Set* in, a just number of *Lines* with those of the *Body* the *Matter* is *Set* in, because the length of the *Page*, as aforesaid, must be *Justified*. And he always forecasts to put rather more than less *White* before the *Title* than after it ; because the *Title* has relation to the *Matter* of the *Chapter* or *Section* it is *Set* to, and therefore ought not to be so distinct, as from the precedent *Chapter* or *Section*.

After his *Title*, he begins his *Chapter* or *Section* with a *Two-lin'd Letter*, or *Three* or *Four-lin'd Letter*, but *Indents* it not. He begins his *Chapter* or *Section* with the first *Line* in the *Stick*, unless his *Stick* be very Deep, or his *Two* or *Three-lin'd Letter* small, because it may else reach above the top of the *Stick*, and so hinder him from filling up *Lines* to the *Body* of the *Two* or *Three-lin'd Letter*.

After the *Two* or *Three-lin'd Letter*, he *Sets* a *Capital Letter* of the *Body* his *Matter* is of, and *Indents* all, those *Lines* that are to fill up the *Great Letter* with an n *Quadrat*.

He cannot use his *Composing-Rule* (mentioned in the foregoing part of this ¶) till he have filled up *Lines* to the *Body* of the said *Great Letter* ; because his *Composing-Rule* is too long to go between the *Great Letter* and the *Head* of the *Stick* : but then he uses the end of a *Riglet* to rub along the *Lines* he

has *Composed* to smoothen them, and so *Set* on till he has filled up the whole *Body* of the *Great Letter*, and most times somewhat above it; which *Letter* he afterwards *Justifies* with *Small Bodied Quadrats*, or with *Scaboards* or *Cards*, or with any or all of them till the *Great-letter* stands even with the number of *Lines* that it *Indents*, and afterwards uses his *Composing Rule*, and *Sets* the succeeding *Lines* to their full Length.

If it be a great *Wooden Letter*, he begins his *Chapter* or *Section* with, it is most times too *Deep* for the height of the *Cheeks* of his *Stick*; therefore he *Justifies* his *Stick*-full just to the breadth of the *Wooden Letter* with *Quadrats* or *Quotations*, and *Sets* on between those *Quadrats* or *Quotations* and the *Head* of his *Stick*, as I shewed before, till his *Stick* be full of *Lines*; which *Lines* he *Empties*, leaving the *Quadrats* or *Quotations* in his *Stick*, to serve, as before, for the succeeding *Stick* or *Sticks*, till he have *Composed Lines* enough for the *Depth* of the *Wooden Letter*.

As he *Sets* on, he considers how to *Point* his *Work*, viz. when to *Set*, where; where: and where. where to make () where [] ? ! and when a *Break*. But the *Rules* for these having been taught in many *School-books*, I need say nothing to them here, but refer you to them.

And as he considers how to *Point*, so he considers what proper *Names*, either of *Persons* or *Places*, he meets with in his *Copy*, as also what *Words* of great *Emphasis*, and what *Words* of smaller *Emphasis*, what *Obsolete Words*, and what *Foreign*, &c.

When

When he meets with proper Names of Persons or Places he *Sets* them in *Italick*, if the Series of his *Matter* be *Set* in *Roman*; or in *Roman* if the Series of his *Matter* be *Set* in *Italick*, and *Sets* the first *Letter* with a *Capital*, or as the Person or Place he finds the purpose of the Author to dignifie; all *Capitals*; but then, if conveniently he can, he will *Set* a *Space* between every *Letter*, and two or three before and after that Name, to make it shew more Graceful and Stately. For *Capitals* express Dignity where-ever they are *Set*, and *Space* and Distance also implies stateliness.

Words of great Emphasis are also *Set* in *Italick*, and sometimes begin with a *Capital Letter*: If the Emphasis bear hard upon the Word to be express as well as the Thing to be express, it ought to begin with a *Capital*. I shall bring for instance an Observation I made above forty years ago on the Word *that*, viz. that that Word may be reiterated five times, and make good Sense: If it be set thus it will seem nonsense, that that that that that; but if it be *Set* thus, that that That that that Man would have stand at the beginning of the *Line* should stand at the end; it will, by toning and laying Emphasis on the middlemost That become good Sense. Now all the thats ought to be *Set* in *Italick*, and the middlemost That ought to begin with a *Capital*, because it is both the Thing and Word.

Words of a smaller Emphasis may be *Set* in the running Character, viz. *Roman*, if it be the Series of the *Matter*; or *Italick*, if *Italick*, but begun with a *Capital*: Instance in the last Sentence, That which expresses both the Thing and Word, &c. Here Thing and Word

both bear Emphasis, though not very great, and therefore ought to be dignified more than those Words that precede or follow those Words. Yet I know some Authors are now so nice to mark both the Word Thing and the Word Word in *Italic*.

After a . though not at the end of a *Break* he begins with a *Capital*.

When in *Composing* he comes near a *Break*, he for some *Lines*, before he comes to it considers whether that *Break* will end with some reasonable *White*; If he finds it will, he is pleas'd, but if he finds he shall have but a little single *Word* in his *Break*, he either *Sets* wide to drive a Word or two more into the *Break-line*, or else he *Sets* close to get in that little Word, because a *Line* with only a little Word in it, shews almost like a *White-line*, which unless it be properly plac'd, is not pleasing to a curious Eye.

Nor do good *Composers* account it good Workmanship to begin a *Page* with a *Break-line*, unless it be a very short *Break*, and cannot be gotten in in the foregoing *Page*; but if it be a long *Break*, he will let it be the *Direction-line* of the fore-going *Page*, and *Set* his *Direction* at the end of it.

Indenting after a *Break* (unless it be the end of a *Chapter* or *Section*) is an m *Quadrat*, (more or less is not proper) *Set* at the beginning of the *Line*: But when Verses are *Indented*, two, three or four m *Quadrats* are used, according to the number of the Feet of the Verses, but most times according to the fancy of the Author.

English obsolete Words he *Sets* in the *English* Character,

acter, the first *Letter*, if the dignity of the Word require it, as aforesaid, with a *Capital*.

Foreign Languages he meets with in his *Copy*, if the *Master Printer* have them in his House, he *Sets* them in the proper Character; if not, the Author must write them in the common Character, and the *Compositer Sets* them as they are written.

That I may be the less unintelligent to the Reader, I will inform him that in *Printers* Dialect (as in this last Paragraph it is used) *Language* is understood *Letter*: For the *Compositer* does say, I shall use a Word or two of *Greek Letter*, or *Hebrew Letter*, or *Saxon Letter*, &c. but I shall use a word or two of *Greek*, a Word or two of *Hebrew*, *Saxon*, &c. so that the Word *Letter*, is in *Compositers* Dialect, understood by naming the Language.

If *Indentures* instead of *Marginal Notes* come in a number of *Lines*, he *Indents* his *Stick*, as I shewed you he did for a *Wooden Letter*, leaving a convenient *White* between his *Matter* and *Indenture*, and then again *Indents* his *Stick* to *Set* the *Matter* that comes in those *Indentures*, allowing a reasonable *White* between the Top and the Bottom of his *Indenture*, and then *Justifies* it up to an exact number of *Lines*, as he did the *Wooden Letter*.

If *Marginal Notes* come down the side (or sides, If the *Page* have two Columns) he chuses to *Set* them in on the *Stone*, rather than in his *Galley*; because both his *Page* and *Notes* stand safer, being cloathed with the *Furniture*, than they do when they stand Naked in the *Galley*. Therefore I shall say nothing of *Marginal Notes* till I come to *Imposing*.
Some

Some other Circumstances (according as variety of Work does happen) a *Compositer* may meet with; but by what has been said upon this and several other Trades, the Ingenious (as they occur) may easily consider how they are to be performed.

Nor (as afore was hinted) is a *Compositer* bound to all these Circumstances and Punctilio's, because, in a strict sense, the Author is to discharge him of them in his *Copy*: Yet it is necessary the *Compositer's* Judgment should know where the Author has been deficient, that so his care may not suffer such Work to go out of his Hands as may bring Scandal upon himself, and Scandal and prejudice upon the *Master Printer*.

¶ 6. Of Tying up a Page.

We may remember the *Compositer* has yet a Page in his *Galley*; This Page must be Tied up with a *Packthred Cord*, courser or finer according to the bigness of his *Letter* and *Page*: For *Small Letter*, which rarely is used to great *Pages*, he chuses a fine *Packthred*, strong and limber; but for great *Letter* and great *Pages* a stronger that will better endure hard pulling at: Wherefore he seeks a *Cord* for his purpose, or else takes so much off the whole *Quoil* as will serve his turn, and taking the end on't in his Right Hand, lays that end about an Inch within the *Direction-line*, and a little lower than the middle of the *Shank* of the *Letter*, and holds that end there close with the two Fore-fingers of his Left Hand, then he slides his Right Hand along the *Cord*,

Cord, straining it as stiff as he can along the right side of the *Page*, and turns it about the *Head* of the *Page* as close down to the *Ledge* of the *Galley* as he can, and so slides his Hand over the *Cord* till he draws it about all the sides of the *Page*: and when he comes to the first end of the *Cord*, he doubles up that end so as it stand above the *Face* of the *Letter*, and whips the *Cord* over that end, that the end may not slip; then he twists part of the remaining *Cord* about his Right Hand, and grasping his Left Hand Fingers about the *Direction* Corner of the *Page*, as well to hold the end of the *Cord* from slipping, as to keep the *Page* tight in its position, with his Right Hand he pulls the *Cord* as hard down the side of the *Page* as he can; and keeping the *Cord* straining, whips it again about the *Head* and other sides of the *Page*, and so again about all the sides of the *Page*, keeping it still straining; and always as he comes to the Right Hand side of the *Page*, pulling hard, and taking care that it slip not: Having whipt the *Cord* twice about the *Page*, he holding two of his Left Hand Fingers against the *Direction* corner upon the *Cord*, that it slip not, with the Ball of his Thumb of his Right Hand, and the Balls of his Fingers to assist, thrusts against the opposite diagonal corner of the *Page*, and removes it a little from the *Ledges* of the *Galley*, that he may with the Nail of the Thumb of his Right Hand have room to thrust the *Cord* whipt about the *Page*, lower down upon the *Shank* of the *Letter*, (to make room for succeeding whippings of the *Cord*, and then thrusts or draws the *Page*

close to the *Ledges* of the *Galley* again; then whips the *Cord* again about the *Page* (as before) till he has whipt it four or five times about the *Page*, taking care that the several whippings lye parallel to each other, not lapping over any of the former whippings.

Having whipt the *Cord* four or five times about the *Page*, he with his *Bodkin* or the corner of a *Brass Rule* (which lies best at hand) fastens the *Cord*, by thrusting a noose of it between the several whippings and the Right Hand side of the *Page*, close up to the *Direction-line*, then draws the lower part of that Noose close up to the very corner of the *Direction-line*, that it may be the better fastned between the *Page* and the Whippings: Then, if his *Cord* be not of a just length, he cuts it off from the rest of the Quoil, leaving so much length to it as that the end of it may stand upright an Inch or two above the *Face* of the *Letter*; the reason will shew it self when we come to *Imposing*. Then he removes the *Page* pretty far from the *Ledges* of the *Galley*, to see if the Whippings lye about the middle of the *Stank* of the *Letter*; if they lye too high, as most commonly they do, he thrusts them lower with the Nail or Nails of his Thumbs. Then (if the *Page* be not too broad) he places his Fore or Middle Finger, or both, of his Right Hand on the Right Hand Side of the *Page*, and his Thumb on the Left; and bowing his other Finger or Fingers under the *Head* of the *Page*, he tears up the *Handle-end* of his *Galley* with his Left Hand almost upright, and so discharges the *Galley* of the *Page*, by delivering it upright into his Right Hand. Having his *Page*
upright

upright in his Right Hand, at the Head, he claps the Fingers of his Left Hand about the Foot of the Page, upon the ends of the Lines on the Right Hand Side of the Page, and his Thumb on the Left Hand side of the Page, with the Palm of his Hands towards the Face of the Letter, and such Fingers as he can spare bowed under the Foot of the Page, turning the Page with the Face of the Letter from him, and letting it rest upon the inside of his Fingers, under the Right Hand Side of the Page, and so goes with it to the Correcting-stone.

But if the Correcting-stone be full of Forms or other Letters, as many times it is, then before he begins to Tye up his Page he provides a Sheet of Waste Paper, supposing it a Quarto Page, and doubles that Sheet in four, and while he has the Page upright in that Hand (as aforesaid) he takes that doubled Sheet into the Palm of his Left Hand, and claps it against the bottom of the Page, and turning his Left Hand outward, receives the Page flat upon the Paper on the Palm of his Hand: Then with his Right Hand grasps the Sides of the Page and the Sides of the Paper, which turn up again above the bottom of the Page, and sets it on a Letter-Board, or some other board in a convenient place under his Case. He places that Page on the Left Hand the Board with the Foot of the Page towards him, that the other Pages that are in like manner set on the Board afterwards, may stand by it in an orderly succession against he comes to Impose them.

If it be a large Folio Page, or a Broad-side he has Tied up, he cannot take that into his Hands, be-

cause

cause it is too broad for his Grasp; therefore he carries his *Galley*, *Page* and all to the *Correcting-stone*, and turns the *Handle* of the *Galley* towards him, and taking hold of the *Handle* with his Right Hand, he places his Thumb and Ball of his Thumb on his Left Hand, against the inside the *Head-ledge* of the *Galley*, to hold it and keep it steady, and by the *Handle* draws the *Slice* with the *Page* upon it, out of the *Galley*, letting the *Slice* rest upon the *Correcting-stone*: Then he thrusts the *Head-end* of the *Slice* so far upon the *Correcting-stone*, that the *Foot* of the *Page* may stand an Inch or two within the outer edge of the *Correcting-stone*; and placing his Left Hand against the *Foot* of the *Page*, in the same posture he last plac'd it against the *Head-ledge* of the *Galley*, he draws the *Slice* from under the bottom of the *Page*, and leaves it upon the *Correcting-stone*. See *Plate 25. at A.*

¶ 7. Of Imposing.

Imposing is the placing of the *Pages* that belong to a *Sheet*, with the *Chase* and *Furniture* about them, in such an order as when the *Sheet* is wrought off at the *Press*, all the *Pages* may be Folded into an orderly succession.

There are four *Volumns* in use that are differently *Imposed*, viz. *Folio*, *Quarto*, *Octavo* and *Twelves*.

The manner of *Imposing* these *Sheets* will be plainer represented in a Table than by many words; therefore in *Plates 26, 27, 28*: I have given you Drafts of each *Volumn*, both *First* and *Second Form*, viz. *White Paper* and *Reiteration*; as you may see noted over each *Form* in the *Plates*. For Example, the two *Forms* in the *Folio Sheet*: In the *First Form* you

you may see 1 on the Left Hand and 4 on the Right, which shews that the *First Page* must stand on the *Correcting-stone* on that Hand, and the *Fourth* on the Right Hand, with the *Foot*s of the *Pages* towards you; and so for all the other *Forms*. The number of the *Page* belonging to each *Sheet* is marked in what place it is to stand on the *Stone* in the *Chase*, and the Figures of those Numbers are placed with their *Head* and *Foot* upwards and downwards, as the *Heads* and *Foot*s of the *Pages* must stand in the *Chase*.

The places of these *Pages* for all *Volumns* the *Compositor* has always in his memory, yet has he a help if he remember the places of but the first half of the number of *Pages* of each *Volume*: For if he knows the place of the first *Page*, the *Page* that stands next it must be that number which makes one more than the number of all the *Pages* in the *Sheet*. For Example, in the *Folio*; next the *First Page* stands the *Fourth Page*, 1 and 4 added makes 5, viz. one more than the number of *Pages* in the whole *Sheet*. See Plate 26. Again, In the *Twelves Volume* next the *First Page* stands the *Twenty Fourth*, 1 and 24 added makes 25: Next 2 stands 23, which added makes 25, viz. one more than the number of *Pages* in the whole *Sheet*. This is a help, and a certain Rule for placing the *Pages* of any *Volume*, if he knows but by memory the places of the first half number. See Plate 27. Thus you will find an *Even* and an *Odd Page* stand together.

The other *Volumns*, viz. *Sixteens*; *Twenty-fours*, *Thirty-two's*, are but the *Octavo's* and *Twelves* doubled, or twice doubled and *Imposed* in *Half-Sheets*. For Example, The *Sixteens* is two *Octavo's Imposed*

on each side the *Short Cross*; the *Twenty-fours* is two *Twelves* Imposed on each side the *Long Cross*; and a *Thirty-two's* is four *Octavo's* Imposed in each *Quarrer* of the *Chase*. And thus they double a *Volumn* as oft as they think fit. But as was said before, they are Imposed on each side the *Cross*, or in each *Quarter* of the *Chase*, as the *Volumn* that is doubled or re-doubled is Imposed in the whole *Chase*.

In *Half-sheets*, all the *Pages* belonging to the *White Paper* and *Réiteration* are Imposed in one *Chase*, and are plac'd, as you see by the *Drafts* (in *Plate 28.*) of *Half-sheet Forms*. So that when a *Sheet of Paper* is Printed on both sides with the same *Form*, that *Sheet* cut in two in the *Short Cross*, if *Quarto* or *Octavo*, and in the *Short* and *Long Cross*, if *Twelves*, and folded as *Octavo* or *Twelves*, the *Pages* (I say) of each *Half-sheet* shall follow in an orderly succession.

Having premised thus much, he takes up the *Pages* he set by on *Papers* in an orderly succession when he Tied them up, grasping the edges of the *Papers* that stick up on both sides the *Page* tight, that so the bottom of the *Paper* may stand the stronger against the bottom of the *Cover*, to keep it from falling out; and bringing it thus to the *Correcting Stone*, he gets the two last Fingers of his Right Hand under the Head of the *Page*, but not under the *Paper* sticking up about the Head of the *Page*, keeping his other two Fingers and Thumb on the sides of the *Page*, and slips or slides his Left Hand, so as the Palm of it may turn towards the bottom of the *Page*; and holding the *Page* up on

end on his Right Hand, he discharges his Left to take away the Paper behind the Page; then he grasps his Left Hand about the *Foot-end* of the Page in the same posture that his Right Hand grasps the *Head-end*. And having the Page thus between his Hands with the bottom of the *Letter* towards him, he directs both his Hands to the place on the *Stone* where the Page must stand, and claps it down on the *Stone* so nimbly, that the whole bottom of the Page comes all at once to the Face of the *Stone*, lest otherwise he endanger the *Breaking*, *Squabbling*, or *Hanging*, &c. of the Page. And thus he sets down all the Pages of the *Form*; which having plac'd in order and rank, as before I have shew'd in the Drafts of each respective Volume, he lays the *Chase* about them; and (if he have not a *Form* already *Drest*) seeks out *Inner Side* and *Head-sticks* of such a thickness, as with the *Cross* may make a *Margin* between the adjoining Pages convenient to the Volume and size of the Paper.

If his *Side* or *Head-sticks* be a little too thin, and and he cannot find any to his intended thickness, he puts a *Seaboard* or two between the *Head* or *Side-stick* and the *Cross*, as well to have more *Margin* as to comanode the *Press-man* (if occasion be) when he makes *Register*, as I shall further shew when I come to the Section of the *Press-man*.

Then he seeks out *Side* and *Foot-sticks*, his *Side-stick* of the exact length of the Page, or a *Seaboard* shorter, or he cuts them to that length, that the *Foot-stick* Bear not against the end of the *Side-stick*, because then the *Letter* will not *Rise*, for the

Foot-

Foot-stick must be a little longer than the breadth of the *Page*, that it may shoot beyond the end of the *Side-stick*.

Then he fits the *Chase* and *Furniture* at *Side* and *Foot*, with *Fore* and *Hind Quoins*, and takes off the *Cords* from the *Pages*, as shall be shew'd by and by.

But if *Marginal Notes* come down the *Side* or *Sides* of the *Pages* (for if there be two *Columns* in a *Page*, the *Marginal Notes* may come down both sides) then, before he fits his *Foot-sticks* he sets a *Scaboard* the length of the *Page*, against the side of the *Page* the *Notes* come on, and a row of *Quotations* almost down the length of the *Page*, or sometimes but one or two in a place at convenient distances, to keep the *Letter* of the *Side* of the *Page* upright, according as he finds his particular *Notes* stand near or far asunder, and afterwards fits his *Foot-stick*. Then he *Sets* his *Notes*, commonly between the *Cheeks* of his *Strick*, which for that purpose are fitted to the *Measure* of the *Quotation*: And having *Set* them, he places them in the proper places where they must come in, and with *Quotation Quadrats* of proper *Bodies*, *Justifies* them up, feeling (at last) carefully and cautiously at the *Foot*, that they be neither too soft nor too hard *Justified* to the length of the *Page*.

Now if he have a *Chase*, or *Form*, or *Furniture* already *Drest* (these several phrases are used, though they all signifie the same thing.) If he have (I say) a *Form Drest*, that is, if he or other *Workmen* have been *Working* on the same *Work*, i. e. *Book*, before he uses one of the *Wrought-off Forms*, and having it on

on a *Letter-board*, *Rinc'd*, as was shew'd in ¶ 2. of this Section, he places it on a Bench or Joint-stool, on that Hand that stands most commodious with that end of the *Stone* he *Imposes* on, and so as there may be a corresponding position, with the *Form Wrought off* and that *Imposing*, viz. that the *First Page* (and consequently all the rest) of the *Wrought off Form* stands on the same Hand with the *First Page* of that *Form* that is *Imposing*.

Then taking out and laying the *Quoins* in their proper places, as I shew'd when he *Stript* the *Form*, at the latter end of ¶ 2. he a little wriggles the *Chase* from one Side to the other, and forward and backwards to Loosen it, and the *Cross* or *Crosses* from the close pinching of the *Letter* and *Furniture*: then takes it off the *Chase*, and lays it a bout those *Pages* he is *Imposing*: Then with his two fore-fingers and Thumbs he takes away the *Inner Side-stick* and the *Head-stick* at once, and at once removes them to the responding *Quarter* of the *Form Imposing*, into the responding places from whence he took them in the *Wrought off Form*. And as he does by the *Inner Side-sticks*, so he does by the outer *Side-sticks*, and by the *Quoins*; placing them in their respective proper places between the *Furniture* and *Chase*, or so many of the foremost *Quoins*, as will go in before the *Cords* are unwhipt from the *Pages*. Thus the *Wrought off Form* is *Stript* and *Naked*; and stands by to *Destribute*.

Having thus translated the whole *Furniture* of the *Wrought off Form* to the *Form Imposing*, he finds the end of the *Cord* that he left sticking up above the

Face of the *Letter* (which perhaps by this time is got between the *Furniture* and the *Page*) and laying the Ball of his left Thumb, on the Face of the *Letter* at the *Direction* corner of the *Page*, to keep it from *Rising*, he takes the aforesaid end of the *Cord*, between the Fore-finger and Thumb of his Right Hand, and pulls gently to loosen the Noose that fastned the *Cord* when he *Tyed up* the *Page*, till he draws the Noose out, and after it successively all the several Whippings; which done, he places the Balls of his Thumbs, one against the middle of the *Side-stick*, and the other against the middle of the *Foot-stick*, and at once thrusts the *Page* close against the *Inner-Side* and *Head-stick*, and so makes room to get in all the *Quoins*. But if there be more than one *Page* in a *Quarter*, as in *Octavo's* and *Twelves*, then he unties all the *Pages* of that *Quarter*, beginning with the *Inner Pages* first, before he can put in the *Quoins*. Then again, thrusting hard with his Thumbs, against the outer Sides of the *Side* and *Foot-sticks* of the several *Quarters*, to thrust the *Letter* up tight and Square, he looks over the *Form* as nicely as he can, to see what *Letter* or *Letters* may *Rise* in the *Form*, (that is, stand higher than the rest) and with the Balls of his Fingers of both his Hands, (the *Quoins* being close and hard thrust up) pats upon the Face of the *Letter* to beat them down: But this is not enough to smoothen the *Form*, but only to smoothen it so as the edges of the *Dressing-block* (when it comes to smoothen it quite) may not job against them. Then he takes the *Dressing-block*, described Section 9. ¶ 3. in his left Hand, and lays the

the smooth side of it upon the *Face* of the *Letter*, at the bottom of the *Quarter* next him ; or he takes the *Shooting-stick*, or sometimes the lower part of the clutched Fist of his right Hand, and knocks either with the Head of the *Shooting-stick* (or his Fist, as aforesaid) gently upon the upper Side of the *Dressing-block*, with quick knocks, removing the *Dressing-block* in a lineal rank upwards, and knocking still quick upon it, as it goes along and comes down again with the *Dressing-block*, in another lineal rank parallel to the first : Then in the same order goes up again and down again, till he have run over the whole *Form*, still knocking with quick knocks upon the *Dressing-block*, that so he may be sure to press down every *Rising Letter* in the whole *Form*, if he see any *Spaces* or *Quadrats* stick up, he thrust them down with his *Bodkin*.

Then to *Lock* up the *Form*, he takes the *Shooting-stick* in his Left Hand and the *Mallet* in his Right, and placing the *Foot* of the *Shooting-stick* against the small *Quoin* between the *Side-stick* and the *Chase*, drives that a little gently up, and then removes the *Shooting-stick* to the next *Quoin*, and so to the third *Quoin* (if there be so many) between the *Side-stick* and the *Chase* ; Then removes his knocking to the thick end of the *Foot-stick*, and afterwards knocks the *Foot Quoins* gently up : Then knocks pretty strongly with the *Shooting-stick* against the thick end of the *Side-stick*, and *Drives* the *Quoins* yet harder up : Then to the thick end of the *Foot-stick*, and and *Drives* those *Quoins* also harder up. Then at last knocking again, against the thick ends of the *Side*

and *Foot-sticks*, he knocks up the *Quoins* so hard, as that he thinks the *Form* may *Rise*: To try if it will, he draws the hither Side of the long Side of the *Chasê*, about an Inch or two over the edge of the *Stone*; and putting his two hands under the *Chasê*, Dances the *Form* three or four times so as it may just *Rise* off the *Face* of the *Stone*: but not so high as that any loose *Letters* or *Spaces* may drop out, if there be any in; but only so high as he may see if there be any in or no. If he finds there are many in that do not *Rise* with the *Form*, he says the *Form* Dances, wherefore he looks carefully upon his *Pages* of *Letter*, to find out the Cause: For generally, either the *Letter Hangs* or the *Lines*, are ill *Justified*: or else it is not *Hard* enough *Lockt* up.

If he finds by his *Eye* the *Letter Hangs*: he must *Un-lock* and *Loosen* the *Form*, or that *Quarter* that *Hangs* pretty *Loose*, that the *Letter* may be set to *Right*; which he does with patting upon the *Face* of the *Letter* where it *Hangs*, with the *Balls* of the *Fingers* of both his *Hands*, to twist or turn them into a *Square* Position.

If it be only a *Single Letter* or two that drops, he thrusts the end of his *Bodkin* between every *Letter* of that *Word*, till he comes to a *Space*: and then perhaps by forcing those *Letters* closer, he may have room to put in another *Space* or a *Thin Space*; which if he cannot do, and he finds the *Space* stand *Loose* in the *Form*; he with the *Point* of his *Bodkin* picks the *Space* up and bows it a little; which bowing makes the *Letters* on each side the *Space* keep their parallel distance; For by its *Spring* it thrusts the
Letters

Letters that were closed with the end of the *Bodkin* to their adjunct *Letters*, that needed no closing. Or sometimes he chews a small bit of *Paper*, and with the *Point* of his *Bodkin* forces that in on one side of the *Space*: and so fills up the Vacancy between the *Space* and the *Letter*. But both these ways are meer present Helps, and (in plain terms) accounted Botches, as being an Argument that his *Lines* were not well *Justified* in his *Stick*.

If he finds the *Form* or any part of it, was not hard enough *Lockt* up, he *Locks* all, or part harder up, as was shew'd before.

But now his *Form Rises*; Wherefore he draws the Long *Side* of the *Chase* (as before) a little over the edge of the *Correcting-Stone*, and putting two or three of his *Fingers* into the Vacancy between the *Quoins*, or else into the Vacancy at the ends of the *Chase*; he tears the *Form* upon the farther *Side* of the *Chase*, and removing his right *Hand* to the Short end of the *Chase*, grasps it near the upper corner, and then discharges his left *Hand* also; and removes it to the diagonal corner of the *Chase*; and so slides the long *Side* of the *Chase* off the hither *Edge* of the *Correcting-Stone*: Then slipping his *Hands* to the bottom of the *Chase*, about two or three *Inches* within the corners, with the insides of his *Hands* towards the *Face* of the *Letter*, and leaning the upper *Side* of the *Chase* against the upper part of his *Breast*, and clutching the *Brawn* of the inside of the upper *Joynt* of his *Arm* over the upper corners of the *Chase*, he carries the *Form* so before him to the *Press*, and lays it upon the *Stone*, for the *Press-man* to make a *Proof*

of. The *Proof* being made, the *Press-man* brings the *Proof*, and layes it on the *Compositers Case*: and he brings the *Form* again and layes it on the *Correcting-Stone*, and rubs it over with the *Ly-Brush*, as shall be shew'd in proper place. And the *Compositor* gives the *Correcter* the *Proof* and his *Copy* to *Correct* it by: which being *Corrected*, the *Correcter* gives it again to the *Compositor* to *Correct* the *Form* by.

¶ 8. Of *Correcting*.

If there be but few *Faults*, and those easie ones, the *Compositor* Gathers the *Corrections* in his *Stick*, beginning at the bottom of every *Page*, and so ascending upwards: Because when he is *Correcting*, the *Corrections* of the top of the *Page* stand then first in the *Stick*, and therefore are readiest to his *Hand*. But if there be many *Faults* he brings the *Lower-Case* to the *Correcting Stone*, and takes his *Corrections* as he uses them.

Then with the *Mallet* and *Shooting-stick* he *Unlocks* the *Form*, as was shew'd in ¶ 3 of this Section. But keeps the *Quoins* pretty tight up, to secure the *Letter* from *Squabbling* or *Hanging*.

Then he *Folds* his *Proof* so oft double, till all the *Pages*, except that he intends to *Correct* first are *Folded* out of *Sight*, and he also *Folds* down the *Left Hand Margin* of that *Page* under the *Proof*, and then lays that *Folded Side* of the *Page* along, and close to the same *Page* in the *Mettle*: So that the *Head-line* in the *Proof* lye in the same range with the *Head-line* on the *Mettle*, and the *Foot-line* even with

with the *Foot-line* on the *Mettal*, and consequently all the *Lines* of that *Page* both on the *Proof* and *Mettal* agree, and stand in a mutual range.

Now therefore he looks in the *Proof*, to see where the *Corrector* has markt a *Fault*, and having found it in the *Proof*, he runs along that *Line* with his *Eye* to the same *Line* on the *Mettle*, which he easily does, because the *Line* of *Mettle* stands in the same range with that in the *Proof*, and finding the *Fault* in the *Mettle* also, he having now his *Bodkin* in his right Hand, with the *Blade* of it between his Fore-finger and Thumb, within half an Inch or three quarters of the *Point*, and the middle of the *Bodkin* within his clutched Hand to guide and command it, he sticks the *Point* of his *Bodkin* into the *Neck* of the *Letter*, viz. between the *Beard* and the *Face*, and lifts it with the *Point* of the *Bodkin* so high up above the *Face* of the other *Letters*, that he can lay hold of it with the Fore-finger and Thumb of his left Hand to take it quite out.

I must a little digress, to paraphrase on the posture he holds the *Bodkin* in: For in the sticking his *Bodkin* into the *Letter*, he holds the *Blade* of it, so that it may make as small an angle with the *Face* of the *Letter* in the *Form* as he can, viz. as flat towards the *Face* of the *Letter* as he can, without touching the *Face* of any of the adjacent *Letters* with the *Blade* of the *Bodkin*; For if he touches the *Face* though lightly, yet it may more or less *Batter* and spoil the *Face* of those *Letters* it touches, and so he creates himself a fresh trouble to mend them.

The reason why he holds the *Blade* of the *Bodkin*

as flat to the *Form* as he can, is, Because a small Horizontalish entrance of the *Point* of the *Bodkin* into the *Neck* of the *Letter*, will raise the *Letter* up above the *Face* of the *Form*, the *Blade* of the *Bodkin* being fastned in the little Hole it makes in the *Neck* of the *Letter* : But if he should stick the *Point* of the *Bodkin* straight or straightish down upon any part of the *Letter*, it would indeed make an Hole, but not fasten in the *Mettle*, to draw it up ; for the weight of the *Letter* would make it slip off the round and smooth *Point* of the *Bodkin*. Besides the pressing the *Point* of the *Bodkin* with his right Hand against the side of the next *Letter* on his left Hand, keeps the *Point* of the *Bodkin* fast in the little Hole it makes in the *Neck* of the *Letter*, and therefore though the *Bodkin* have but a little entrance, yet it has hold enough to draw it up by. Now to return.

Having taken the Fault out, he puts the *Letter* that the *Correcter* markt in the *Margin* of the *Proof* in the room of it. Suppose an o were markt and n dasht out, therefore when he has taken the n out he puts an o in the room : These two *Letters* being of equal thickness, gives him no trouble to *Justifie* the *Line* again after the Fault is *Corrected* ; but if they had been of unequal thicknesses, as suppose an m to come out, and an n to be put in ; in this case he puts in a *Space* between two words (where he finds most convenient) to *Justifie* the *Line* again : Or suppose an n to come out, and an m to be put in ; now he must take out a *Space* where he finds most convenient to make room for the m, as being thicker by a *Space* than an n. Thus as he *Corrects* he

he still has a care to keep his *Lines* true *Justified*; which he tries by pressing the Balls of his two middle Fingers pretty hard against the ends of three *Lines*, to make them rise a little above the *Face* of the *Form*, whereof the *Line* he examines is the middlemost; for if that *Line* is not hard enough *Justified*, he will between the Balls of his Fingers find it hollow, or it will not *Rise* with the other two: And if it be too hard *Justified*, he will find the Balls of his Fingers *Bear* only or hardest against that *Line*, and the *Line* on each side it will not *Rise*.

If there be a long *word* or more left out, he cannot expect to *Get* that in into that *Line*, wherefore he must now *Over-run*; that is, he must put so much of the fore-part of the *Line* into the *Line* above it, or so much of the hinder part of the *Line* into the next *Line* under it, as will make room for what is *Left out*: Therefore he considers how *Wide* he has *Set*, that so by *Over-running* the fewer *Lines* backwards or forwards, or both, (as he finds his help) he may take out so many *Spaces*, or other *Whites* as will amount to the *Thickness* of what he has *Left out*: Thus if he have *Set wide*, he may perhaps *Get* a small *Word* or a *Syllable* into the foregoing *Line*; and perhaps another small *Word* or *Syllable* in the following *Line*, which if his *Leaving out* is not much, may *Get* it in: But if he *Left out* much, he must *Over-run* many *Lines*, either backwards or forwards, or both, till he come to a *Break*: And if when he comes at a *Break* it be not *Gotten in*; he *Drives* out a *Line*. In this case if he cannot *Get in* a *Line*, by *Getting in* the *Words* of that *Break* (as I just now shew'd you

how he *Gets-in* what was left out in the *Proof*) or by making less *White* to the *Title* of a *Section* or *Chapter* (if any happen in that *Page*) he must *Over-run* the next *Page* backwards or forwards, till that *Line Comes in*: Thus sometimes he *Over-runs* all the succeeding *Pages* of the *Sheet*, and at last perhaps *Drives out a Line to Come in* in the next *Sheet*.

If he have *Set* a word or small sentence twice, he must take that out, and *Drive-out* his *Matter*. If he be near a *Break*, and the *White* of that *Break* not very long, he may perhaps *Drive it Out* at the *Break* by putting in part of the next *Line* to fill up almost so much as he took out; but not quite so much, unless his *Matter* was at first so *Wide Set* that he can *Space out* no more, or unless the *Break-line* he comes to have so much *White* in it that he fears *Getting-in* that *Line*: If either of these inconveniences happen, he *Drives-out* as much as he can backwards in the *Matter*; that is, he takes out so much as he thinks he cannot *Drive-out* when he is at the *Break*: He takes it out at the beginning of the *Line*, and puts it in at the latter end of the *Line* before it: But first he takes out almost so much of the beginning of his Second upper *Line*, to make room for it: I say almost so much, because he intends to *Space-out* the rest if it were not too *Wide Set* at first. And thus he runs on from *Line to Line*, still taking out less and less at the beginning of every former *Line*, and putting it into the *Line* above that, that he may *Space-out* his *Matter* as he *Over-runs*, till his *Double-Setting* is *Driven-out*.

But if he have *Set a Line or Lines* twice, and cannot

cannot *Drive* it or them *Out* at a *Break* or *Breaks* ; or that he cannot *Set* more *Whites* at the beginning of a *Section* or *Chapfer*, he must *Over-run* the next *Page* or more, or the whole *Sheet* till it be *Driven-out* : And if in *Over-running* the whole *Sheet* it be not *Driven-out* , he must *Set* so many *Lines* , of the following *Matter* as will make up the last *Page*.

Many times either for *Getting-in* or *Driving-out*, the *Compositer* will chuse to *Over-run* in his *Stick*, and then he *Wets* the *Page* he is to *Over-run*, with the *Spunge* (that the *Letter* may the better stick together) and he separates so much of the former part of the *Page* as he intends to *Over-run*, from the rest of the *Page*, and places himself before the *Notches* of the *Letter*, and takes up about an Inch and an half or two Inches of the first Separated *Line*, and brings it to the *Stick* ; and as it is coming along he turns the *Notches* upwards, and places that *Taking up* in the *Stick*. When he *Takes-up*, he places the *Inside* of the first Joynt of his middle Finger of his right Hand against the beginning of that *Line*, and the Ball of his Thumb against the other end of that *Taking-up*, and the Ball of his Fore-finger behind the *Taking-up*, about the middle of it, and so pinching it lightly brings it to his *Stick*, as aforesaid. And having thus by several *Takings-up*, gotten a *Line* into his *Stick*, he looks it over to see what *Spaces* or other *White* he can take out or put in, according as he has either *Left-out* or *Set-twice*, and then he *Justifies* the *Line* again, as was shew'd in ¶ 5. of this Section. And thus he *Over-runs Line* after *Line*,

till he has *Gotten-in* or *Drove-out* his *Leaving-out*, or his *Twice Set Matter*.

If the *Compositer* is not firmly resolv'd to keep himself strictly to the Rules of good Workmanship, he is now tempted to make *Botches*; viz. *Pidgeon-holes*, *Thin-Spaces*, no *Space* before a *Capital*, *Short &s*, *Abbreviations* or *Titled Letters*, *Abbreviate Words*, &c. And if Botching is in any Case excusable, it is in this; for with too great *Spacing-out* or too *Close Setting*, he many times may save himself a great deal of Labour, besides the vexation of mind, and other accidental mischiefs that attend *Over-running*.

It sometimes chances that a *Compositer*, by having two or more *Pages* in his *Sheet* with the same *Direction-line*, or by mistaking the right place of his *Page* when he set it by on a *Paper* under his *Casse*, as was shew'd ¶ 7. of this Section, or by some other accident that may happen; I say it sometimes happens (but seldom through too much care) that he *Transposes* two *Pages*, or more, in his *Sheet*: In this case he *Unlocks* that *Quarter*, or those *Quarters* the *Pages* are in, and loosning the *Cross* or *Crosses* from those *Pages* and their *Furniture*, takes the rest off the *Correcting-stone* with their *Furniture* about them: And if it be a *Folio* or *Quarto* he does not wet the *Pages*, because those *Forms* have *Furniture* about every side of the *Page*, which will keep up the *Letter* from falling down; But he only places the Balls of his two Thumbs against the outside of the *Furniture*, about the middle of the *Head* and *Foot* of the *Page*, and the insides of his two middle Fingers, assisted by his Fourth and Little Fingers,

gers, in a parallel position to his middle Fingers, (to strengthen them against the *Furniture*) about the middle of the *Sides* of the *Page*, letting the length of his Fingers reach as far from each corner of the *Page* towards the middle of it as he can, and so by a steady pressing the Balls of his Thumbs and the Balls of his Fingers on each Hand towards each other, he draws, or as he sees most convenience, thrusts the whole *Page* out of its wrong place, and sets it by on the *Stone*, till in the same manner he removes the other *Transpos'd Page* into the place of the first remov'd *Page*: And thus if there be more than two *Transpos'd Pages* in the *Sheet*, he removes them all, and *Sets* the right *Pages* in their right places.

But if it be an *Octavo* or *Twelves*, or any other *Form* that has *Gutter-sticks* between two *Pages*, he must Wet those *Pages* he leaves on the *Stone*, because when he removes one *Page*, by the help of the *Gutter-stick*, one side of the other *Page* will stand *Naked*; and consequently with the Shaking, Jogging, or Trembling of the *Stone* or Floor, the *Letters* on that side will be in great hazard of falling down, especially if the *Face* of the *Stone* happens not to be truly Horizontal: I say, happens not to be truly Horizontal, because the *Stone* is seldom laid with any caution, but only by guess.

Having placed the *Pages* in their right places, he again lays the *Chase* about them; and *Locks* them up again, as was shew'd in ¶ 7. of this Section: Then he carries the *Form* to the *Press*, and lays it on the *Stone* for a *Second Proof*, and sometimes for

a *Third Proof*; which having *Corrected*, he at last brings the *Form* to the *Press*, and again lays it on the *Stone Right*, viz. in *Folio's* and *Octavo's* with the *Foot* of the *First* or *Third Page* (which he easily knows by their *Signatures*) towards him, and the side of it next the *Plattin*: And in *Quarto's* and *Twelves*, with the *Foot* of the *First* or *Third Page* next the *Tympan*.

After all this *Correcting* a *Revise* is made, and if any *Faults* are found in any *Quarter* of it, or in all the *Quarters*, he calls to the *Press-man* to *Unlock* that *Quarter*, or the whole *Form*, that he may *Correct* those *Faults*: For when the *Form* is on the *Press* it is not the *Compositers* task to *Un-lock* the *Form*: Neither would a good *Press-man* be content he should make a knocking on his *Press*, especially if the *Press-man* have *Made-ready* his *Form*, as shall be shewed in the next Section.

¶ 9. Of Counting or Casting off Copy.

Counting or *Casting off Copy* (for both Phrases are indifferently us'd) is to examine and find how much either of *Printed Copy* will *Come-in* into any intended number of *Sheets* of a different *Body* or *Measure* from the *Copy*; or how much *Written Copy* will make an intended number of *Sheets* of any assigned *Body* and *Measure*.

The Rule and Method of *Counting off* either *Printed* or *Written Copy* is the same, only *Written Copy* is more difficult, because subject to be irregularly *Writ*; Therefore if I shew you how the *Compositor*
Casts

Casts off Written Copy, I do at the same time inform you how to *Count off Printed Copy*.

The *Compositer* therefore first considers what *Bodied Letter* his Work is to be wrought on: then he carefully peruses the *Copy*, considering with himself whether it be evenly Written or unevenly Written, *viz.* whether it be throughout of an equal siz'd Hand, or whether part be close Written and part wide Written; if it be an equal siz'd Hand, that is, equally close Written in general, as well between *Letter* and *Letter*, *Word* and *Word*, as between *Line* and *Line*, he has scarce more trouble to *Count it off* than *Printed Copy*.

Wherefore, the *Measure* being given, he *Composes* one *Line* in his *Measure*: The *Matter* he *Composes* he chuses out of that part of his *Copy* that in his Judgement he admits is most indifferently Written, between Wide and Close, as being such as his whole *Copy*, one part with another, will likeliest *Come-in* alike with: This *Line* being *Compos'd*, he considers how much of his *Copy* it takes up, *viz.* whether it runs *Line* for *Line*, or whether two *Lines* of his *Copy* make one *Line* in his *Stick*; or whether a *Line* and an half, or a quarter, or half quarter of his *Copy*, &c. make one *Line* in his *Stick*; or whether a *Line* of his *Copy* make two *Lines* in his *Stick*, or a *Line* and a half, or a quarter, or half a quarter, &c. and accordingly calculates what just number of *Lines* will make another just number of *Lines* in his *Stick*. For Example.

If his *Copy* and *Measure* run *Line* for *Line*, then consequently 10, 20, 30 *Lines* of the *Copy* will make

10,

10, 20, 30 *Lines* in the *Measure*; and accordingly he counts what number of *Lines* in his *Copy* will make a *Page*; and by that, what number of *Lines* will make two *Pages*, four *Pages*, eight *Pages*, and consequently so many *Pages* and *Sheets* as he is to *Count off*.

If two *Lines* of *Copy* make one *Line* in the *Stick*, then consequently ten *Lines* in the *Copy* will make five *Lines* in the *Stick*; twenty *Lines* in the *Copy* ten *Lines* in the *Stick*, &c.

If a *Line* and a half of the *Copy* make one *Line* in the *Stick*, then fifteen *Lines* of *Copy* makes ten *Lines* in the *Stick*, thirty makes twenty, &c.

But a pair of *Compasses* makes the best expedition in *Counting off* of *Copy*, and (by my experience) I have found the surest way. I *Compose* one *Line* as aforesaid; if the *Line* I *Compos'd* Gets-in part of the next *Line*, viz. the second *Line* of the *Copy*, I place one Foot of a pair of *Compasses* at the beginning of the *First Line*, and open the other Foot to what was *Got-in* of the *Second Line*, and turn the *Compasses* about upon the Foot in the *Second Line*, till the other Foot reach the *Third Line* of the *Copy*; then turn about the Foot in the *Third Line* of the *Copy* till the other Foot falls in the *Fourth Line* of the *Copy*; and so from the *Fourth*, to the *Fifth*, *Sixth*, &c. till the *Compasses* end with a *Line* in the *Copy*, or near the end of a *Line*, remembering as I go along, how oft I turn'd the *Compasses* about. Suppose, for Example, seven times: Then I number the *Lines* of *Copy*, beginning with the first *Line* and ending with the last *Line*, that the Points of
the

the *Compasses* were turn'd over, and find them Eight, Nine, Ten, &c. and say Eight, Nine, Ten, &c. *Lines* of the *Copy*, makes Seven *Lines* of the *Measure*.

As now I have shew'd you how I *Count off Copy* if it come in more than *Line* for *Line*, so I shall shew you how I proceed if a *Line* in the *Copy Drive out* in the *Measure*.

It is but placing one Foot of a pair of *Compasses* at the farther end of the first *Line*, and opening the other Foot to the place where the *Compos'd Line* ended, and by turning about the *Compasses*, as before, to the Second, Third, Fourth *Lines*, &c. till they end in the beginning of a *Line* in the *Copy*; for then (as before) counting the number of *Lines*, beginning with the first, and ending with the last; Suppose Eight, Nine, Ten, &c. I say Eight, Nine, Ten, &c. *Lines* of the *Copy* makes so many *Lines* as is the number of times the Feet of the *Compasses* were turned about, between the first *Line* and the last *Line*.

Another way Arithmetically perform'd.

Suppose it be requir'd to know how many *Sheets* 127 *Pages* of *Written Copy* will make? I count the number of *Letters* contained in an ordinary *Written Line* of *Copy*, such a *Line* as I guess is likely to *Run Line* for *Line* with the generality of the rest of the *Copy*: And (for Example) I find 43 *Letters* in that *Line*: Then I count the number of *Lines* in an whole *Page*, and find 35 *Lines*, I Multiply 43 by

M m

35,

35, the Product is 1505 for the number of *Letters* in an whole *Page*: Then I multiply 1505 by 127, the number of *Pages* in the whole *Written Copy*; the Product is 191135, the number of *Letters* in the whole *Written Copy*.

If it be now required to know how many *Sheets* in *Quarto*, of the *English Body* this *Written Copy* will make, agreeable to any *Measure* already *Printed*: As for Example, the length of a *Page* given is 33 *Lines*, and in one *Line* is contained 47 *Letters*: I multiply 47, the number of *Letters* in one *Line*, by 33, the number of *Lines* in a *Page*, the Product is 1551. With this Product I divide 191135, the number of *Letters* in the whole *Written Copy*, and the Product gives 123, that is, 123 *Pages* in *Quarto*, which divided by 8, the number of *Pages* in one *Sheet*, gives 15 *Sheets* and 3 *Pages*.

If it be required to know how many *Sheets* it will make of *Pica* in an *Octavo*, or of *Long Primer* or *Brevier* in *Twelves*, &c. the manner of Working is the same: For Multiplying the number of *Letters* in one *Line* by the number of *Lines* in one *Page*, and Deviding the number of *Letters* in the whole Work (suppose, as in the foregoing Operation by 191135) by the number of *Letters* in one *Page*, the Product gives the number of *Pages* in the Quotient: And then at last Deviding the number of *Pages* by 16 if an *Octavo*, or 24 if *Twelves*, &c. you have in the Quotient the number of *Sheets*, and in the Remain (if any be) the number of *Pages*.

These two last ways are the surest Rules for Counting off *Copy*: But yet the *Compositer* has several Considera-

siderations upon his *Copy* before he dares conclude he has truly and exactly *Counted off*.

For first, a strict regard must be had to the *Breaks* that come in the *Copy*: For long *Breaks* in the *Copy* are generally likely to be *Got-in*, and consequently a *Line* is *Got-in*: But short *Breaks* often *Drove-out* a *Line*. Therefore though the *Compositer* has already in general *Cast off* his *Copy*, yet he more particularly considers his *Breaks*; and indeed they serve as so many *Regulators* to him, to keep him within the bounds of his *Counted off Copy*: For every *Break* he examines by the number of *Lines* from the last *Break*, by the length of the *Break*, and by the close or wide *Writing* of his *Copy*, whether it will be *Got-in* or *Drove-out*, and accordingly marks it in his *Copy*, before he reckons he has done *Counting off*.

A *Break* to be *Got-in* he marks thus [, and adjoins in Numerical Figures, the number of *Lines* the *Matter* between the last *Break* and it will make. A *Break* to be *Drove-out* he marks thus —, and (as aforesaid) adjoins Numerical Figures to remember him what number of *Lines* he accounted that *Matter* to make from the last *Break*.

If *Chapters*, *Sections* or *Paragraphs* happens in the *Copy*, the *Compositer* takes room enough to set them and their *Titles* gracefully in; and marks in Numerical Figures what number of *Lines* he assigns for it.

If as he *Counts off* his *Copy* he finds *Abbreviated Words*, he tells the *Abbreviated Words* to the full number of *Letters* that spells the *Word* at length, because in *Composing* he *Sets* those *Words* at length:

And should he not consider it in his *Counting off*, he would in *Composing* find his *Matter Run out* from his *Copy*.

Scarce any *Copy* is so regularly Written (as hath several times before been hinted) but that some places are Wider, and other places Closer Written, than the generality of the *Copy*, wherefore he considers both these accidents in his *Copy*, and accordingly allows for them.

If it happens that much *Italick* comes in the *Copy*, as sometimes two or three *Lines*, or more, or half a *Page*, an whole *Page*, or several *Pages*; the *Compositer* considers *Italick* is thinner than *Roman*, and consequently *Gets-in* more than *Roman* does, and therefore in his *Counting off* will allow accordingly for it.

The proportion that I allow for it is as 9 to 10, or which is all one, as 45 *Roman Letters* is to 50 *Italick Letters*: So that if a *Measure* holds 45 *Roman Letters*, the same *Measure* will hold 50 *Italick Letters*.

As *Italick* is thinner than *Roman*, so the *English Face* is thicker than the *Roman*; wherefore if he meets with the *English Face*, he considers that accordingly.

I find the proportion to be as 40 to 43, viz. 40 *English Faced Letters* fill the same *Measure* that 43 *Roman* does; and consequently for every 40 *Lines* to be *Set* in *English* he must *Count off* 43 *Lines*; and so proportionably for more or less.

But yet I shall not deliver these my Observations on the *Italick* and *English* to hold thus in all *Italicks* and

and *Englisses*, nor all *Romans* of the same *Body* to be of an equal Thickness, because some are *Cut* Thicker or Thinner on the *Face*: And besides, sometimes *Letter Cast*, though in the same *Matrices*, are by the *Founder Cast* Thicker or Thinner, and consequently in either Circumstance *Drive-out* or *Get-in*: Wherefore a *Compositer* will consider what *Fount* of *Letter* it is he Works on, and accordingly Count off his *Copy*.

¶ 10. Of Papering up of Pages.

Papering up of *Pages*, or *Papering up* of *Letter*, are two phrases indifferently used for the same meaning. Though this Operation seems so sleight and trivial that it may be thought not worth mentioning, yet it being a task incumbent on the *Compositer*, it becomes mine too to shew how it is performed.

It is thus: When a *Book* is finish'd, and the *Compositer* is to *Work* on other *Letter* afterwards; the *Wrought off Letter* is to be *Papered up*. The *Pressman* therefore having *Wash'd* the *Wrought-off Forms*, the *Compositer* *Rinces* them, as was shewed in Section 22. ¶ 3. He *Rinces* the *Letter* as well as if it were *Rinc'd* for present use, or rather better: for else the *Inck* that is desolved among the *Ly* would, with long standing by, harden between the *Letter*, and make the *Letter* stick so fast together that when it comes afterwards to be *Destributed*, the *Compositer* shall not without great difficulty and trouble get them asunder. This sticking together of the *Letter* is call'd *Baking* of the *Letter*. And *Compositers* in this Case say, *The Letter is Bak'd*. M m 3 The

The *Compositer* having *Strip* the *Form*, whips *Cords* as tight as he can about every *Page*, not to *Tye* them up for good and all, but aswell to keep up the *Letter* on the sides of the *Pages* that it fall not down, while it stands by for some dayes on the *Letter-board* to *Dry*, as to keep the *Letter* tight together that he may the better with his Hands take an whole *Page* at once off the *Letter-board*.

When it is *Dry*, if the *Pages* are not too broad for his *Grasp*, he places his Body against a side of the *Pages*, and the Balls of his two *Thumbs* against the side of a *Page*, one indifferently between the middle and *Head* of the *Page*, and the other between the middle and *Foot* of the *Page*, and with the three *Fore-fingers* of each *Hand* placed on the other side of the *Page*, grasps the *Page* between them and his *Thumbs*; and to keep his Hands the steddier, stretches the insides of his *Little-fingers* one against the *Head* the other against the *Foot* of the *Page*: And having the *Page* thus *Steady* between his Hands close prest on all the sides of the *Page*, he with a quick motion nimbly rears one side of the *Page* upright, and receives the weight of it either on the Balls of his *Thumbs* or on the Balls of his *Fingers*, as best likes him; and so carries it to his *Galley* and *Tyes* it firmly up; as was shewed ¶ 6. of this Section.

As he took and *Tyed* up this one *Page*, so he takes and *Tyes* up all the *Pages*. But if a *Page* be too big for his *Grasp*, he underlays the *Slice* of a *Galley* till it lye within a *Scaboard* so high as the edge of the *Letter-board*, and getting some one to hold the *Slice* steddily against the edge of the *Letter-board* he slides
the

the *Page*, with the *Head* or *Foot* forwards upon the *Slice*, and so carries the *Page* to the *Galley* and *Tyes* it up, as aforesaid.

He sends the Boy to the Warehouse-keeper for so much Paper as he finds he shall want; and if the *Pages* are small, he layes a single Sheet down on the *Correcting-Stone* or on a *Letter-board*, and sets a *Page* down on that Sheet of Paper, so as the farther Side of the *Page* may stand towards one end of the Sheet; and so far on the Sheet, as that the end of it may lap over the *Face* of the *Letter*, and about half way down the *Shank* of the *Letter*, on the hither side the *Page*: And smoothing the Paper tight over the *Face* of the *Letter*, and half way down the *Shank* on the hither Side, and quite down the *Shank* at the *Head* and *Foot* of the *Page*, he folds the loose Paper that hangs over the ends of the *Page*, from each corner of the *Page*, to end in an Angle in the middle of the loose Paper, and then folds the other end of the Sheet of Paper tight over the Paper that covers the *Face* of the *Letter*; and also folds the loose Paper at the ends of the *Page* down into Angles, as he did the former loose ends: Then rearing his *Page* over the further side, lays the *Face* downwards, still smoothing the Paper tight, and folding in the un-folded corners, to meet in the same Angles with the former folded Angles in the middle of the loose Paper: And thus so long as he has Paper to spare he turns his *Page*, wrapping it at least twice, or if he can thrice about in Paper, folding and doubling down the Loose Paper into Angles as before: And at last turns up those Angles or Lappets
either

either over the *Face* or Bottom of the *Letter*, and turns the *Page* upon those folded Lappets, that its weight may press and keep them close under the *Page*.

If the *Pages* are large, so as one *Sheet* will not compass them twice or thrice about, to be strong enough to bear the *Letter*, which generally sinks downwards in the middle of a *Page*, he lays two, or sometimes three *Sheets* under the *Page*: And as he wrapt up the first Lay of *Sheets*, adds more to lengthen them out, that they may wrap at least three or four times about the great *Page*.

Having thus *Paper'd* up the *Pages*, and folded the Lappets under them, he writes upon the upper side what *Letter* it is, viz. *Long-Primer Roman*, *Long-Primer Italick*, *Pica Roman*, *Pica Italick*, *Pica English*, *English Roman*, *Italick*, &c. and sets them by for the *Master-Printer* to dispose of.

§. 23. *Of the Correcter, and his Office.*

A *Correcter* should (besides the *English* Tongue) be well skilled in Languages, especially in those that are used to be Printed with us; viz. the *Latin*, *Greek*, *Hebrew*, *Syriack*, *Caldæ*, *French*, *Spanish*, *Italian*, *High Dutch*, *Saxon*, *Low Dutch*, *Welsh*, &c. neither ought my innumrating only these be a stint to his skill in the number of them, for many times several other Languages may happen to be Printed, of which the Author has perhaps no more skill than the bare knowledge of the Words and their Pronunciations, so that the
Or-

Orthography (if the *Correcter* have no knowledge of the Language) may not only be false to its Native Pronunciation , but the Words altered into other Words by a little wrong Spelling, and consequently the Sense made ridiculous, the purpose of it controvertible, and the meaning of the Author irretrievably lost to all that shall read it in After times.

He ought to be very knowing in Derivations and Etymologies of Words, very sagacious in *Pointing*, skilful in the *Composers* whole Task and Obligation, and endowed with a quick Eye to espy the smallest *Fault*.

But I shall say no more of his Qualifications; but suppose him endowed with all necessary accomplishments for that Office.

The *Compositer* either carries him a *Proof*, or sends the Boy with it to his Appartment, which is commonly some little Closet adjoining to the *Composing-room*: And the *Master-Printer* appoints him some one that is well skill'd in true and quick Reading, to Read the *Copy* to him, whom I shall call the *Reader*.

This *Reader*, as I said, Reads the *Copy* to him, and the *Correcter* gives attention; and at the same time carefully and vigilantly examines the *Proof*, and considers the *Pointing*, *Italicking*, *Capitalizing*, or any error that may through mistake, or want of Judgement be committed by the *Compositer*.

If he finds one *Letter Set* instead of another, as in this Word tho for the, he dashes out the wrong

N n

Letter.

Letter thus *thp*, and Writes the *Letter* *e/* it should be on the Right Hand *Margin* of the *Page*, right against the same *Line*, and makes a Dash behind it, as you may see in the *Margin*.

If two or three, or more Words in the same *Line* have *Faults* in them, as in these Words, *Potientie per force*; where first *a/* *e/* *r/* *o/* an *o* is *Set* instead of *a*, *e* instead of *c*, *t* instead of *r*, and *c* instead of *o*: These he marks in an orderly succession towards the Right Hand, against the same *Line*, as you may see in the *Margin*.

But if one word be *Set* instead of another, as *Scoff* instead of *Smile*, here he marks *Scoff* out thus *Scoff*, and writes *Smile/* *Smile*, as in the *Margin*.

If a *Word* or *Words*, or *Letter*, or *Point* be *Left out* he makes this mark *w* where it is *Left out* for a mark of *Insertion*, and Writes in the *Margin* what must come in.

If a *Space* be *Left out* he makes the former mark of *Insertion* where it should come in, and makes this mark *** in the *Margin*. ** /*

If a whole Sentence be *Left out*, too long to be *Writ* in the *Margin*, he makes the mark of *Insertion* where it is *Left out*, and only Writes *(Out)* in the *Margin*. *(Out)* If the Sentence *Left out* be not very long, he Writes it under the *Page*, or on the Left Hand *Margin* of the *Page*: But if it

it be too large to be Writ in the Margin, or under the Page, he Writes in the Margin, See the Copy. (See the Copy)

If a Word or Sentence be Set twice, as Him Him, he marks out one Him thus Him, and makes this mark § in the Margin, for De- § /
leo, to take out.

If a Letter be turned thus 2, he dashes it out as you see, and makes this mark in the Margin. 2 /

If Words are Transposed, that is, if one Word stand in another Words place, as, no I love Swearing, and it should be, I love no Swearing; he marks this Fault thus, (no I love) Swearing, and makes this mark § in the Mar- § /
gin. The like mark he makes in Matter and Margin if two Letters are Transpos'd.

If a Space or an m or n Quadrat, &c. stick up, and Print Black, as between these words, he marks in the Margin thus. 1

If a Word be Set in Roman Letter instead of Italick or English Letter, he dashes the Word underneath thus, and Writes Ital. or Eng. in the Margin. Ital/ Eng/

In like manner, if a single Letter or more Letters be Set in Roman

N n 2 Let-

Letter, and it should be *Italick* or *English Letter*; or if in *English* or *Italick*, and it should be *Roman Letter*, he dashes the *Letter* or *Letters* thus underneath, and writes *Ital.* *Ital/ Rom/ Eng/ Rom.* or *Eng.* in the *Margin*: Or if *Lower-Case Letters* be *Set* instead of *Capitals*, he dashes them underneath, and Writes *Capt.* in the *Margin.* *Capt./*

Having Read the *Matter* of the *Proof* he examines again if the *Form* be right *Impos'd*, for though he before turn'd the *Pages* in the *Proof* as he read them according to their orderly places, yet he will scarce trust to that alone, but again examines them on purpose, and distinctly, which he does not only by the *Direction Word*, but by examining the whole *Sentence* the *Direction* comes in, both at the end of the *Page*, and the beginning of the next *Page*.

He examines that all the *Signatures* are right, and all the *Titles* and *Folio's*.

If the Work be large *Forms* and small *Letter*, he has a second, and sometimes a third *Proof*, which he Reads as the first.

After the Second or Third *Proof* he has a *Revise*, which is also a *Proof-sheet*: He examines in this *Revise*, *Fault* by *Fault*, if all the *Faults* he markt in the last *Proof* were carefully mended by the *Compositer*; if not, he marks them in the *Revise*.

Thus you see it behoves him to be very careful as well as skilful; and indeed it is his own interest to be both: For if by his neglect an *Heap* be spoiled, he is obliged to make *Reparation*.

Advertisement to AUTHORS.

Although I have in the precedent Exercises shew'd the Accomplishments of a good Compositor, yet will not a curious Author trust either to his Care or Abilities in Pointing, Italicking, Capitalling, Breaking, &c. Therefore it behoves an Author to examine his Copy very well e're he deliver it to the Printer, and to Point it, and mark it so as the Compositor may know what Words to Set in Italick, English, Capitals, &c.

For his Italick Words he draws a line under them thus : For English Words he draws two lines under them thus; and for Capitals a line of Pricks thus, or else draws a line with Red Ink.

If his Copy, or any part of it, be Written in any Foreign Language, he is strictly to spell that

Foreign Language right : Because the Compositor, as I said in the Preface to this §, takes no notice of any thing therein but the very Letters, Points and Characters he finds in his Copy.

If an Author have not (through haste in Writing) made Breaks in proper places; when he comes to peruse his Copy he may find cause to make several Breaks where he made none: In such a case he makes a Crotchet [thus, at the Word he would have begin his new Paragraph.

Thus in all particulars he takes care to deliver his Copy perfect: For then he may expect to have his Book perfectly Printed. For by no means he ought to hope to mend it in the Proof, the Compositor not being obliged to it: And it cannot reasonably be expected he should be so good Natured to take so much pains to mend such Alterations as the second Dictates of an Author may make, unless he be very well paid for it over and above what he agreed for with the Master-Printer.

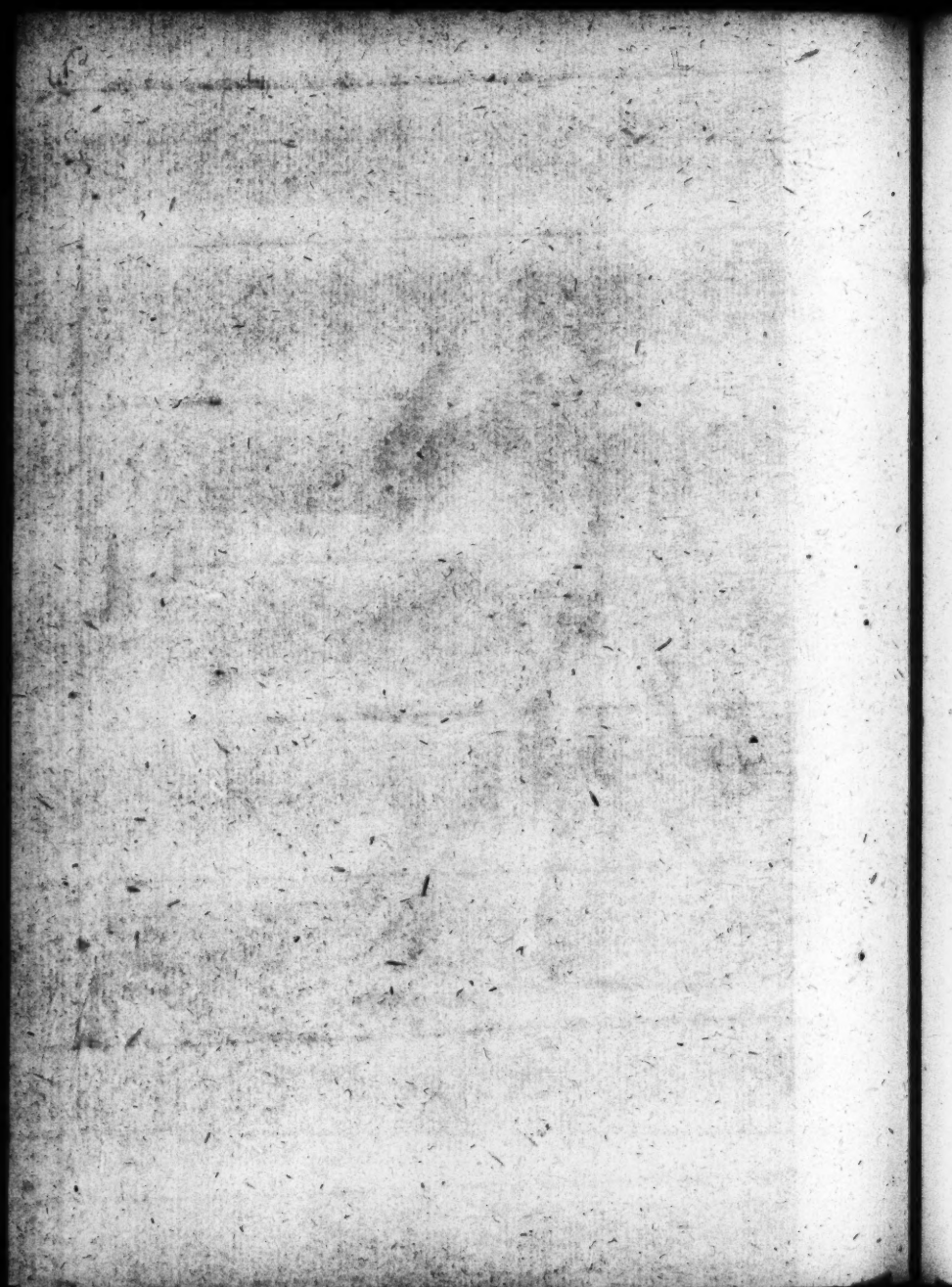
The next Exercises (God willing) shall be
the

the *Press-mans Trade*, The Office of the *Ware-house-keeper*, The *Customs of the Chapel*, And a *Dictionary* to explain the hard Words and Phrases used in the whole Practice of *Typography*: Which will be the Conclusion of this Second Volume.

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Plate 29.



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Plate 30.





Plate 31



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Plate 32.



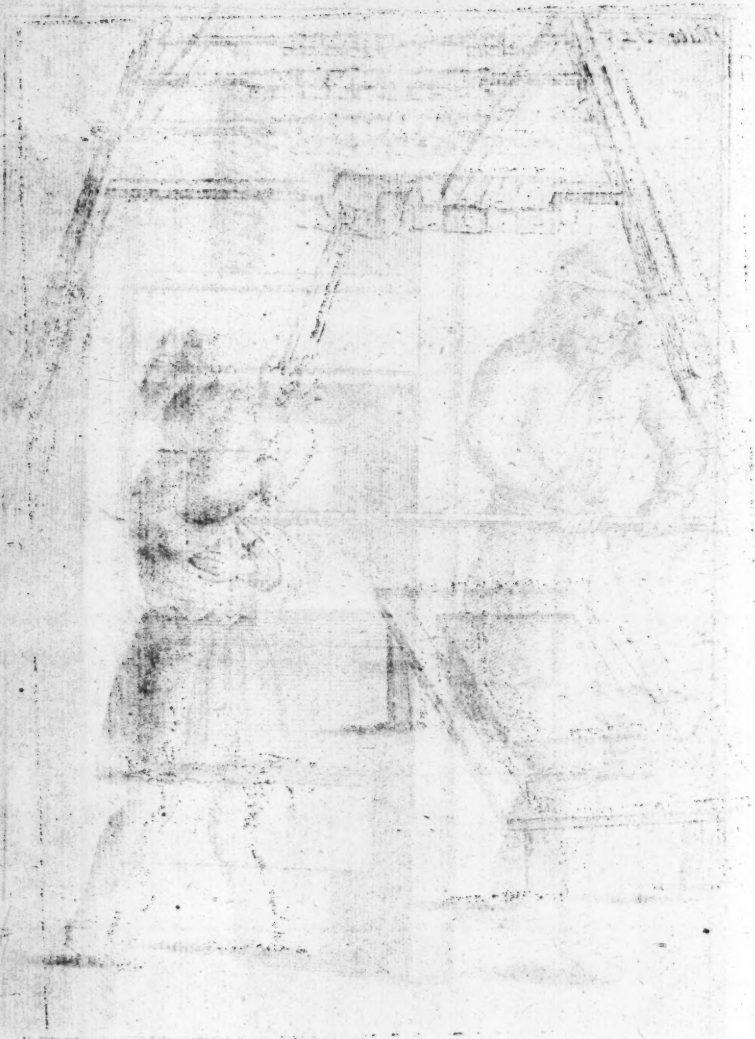
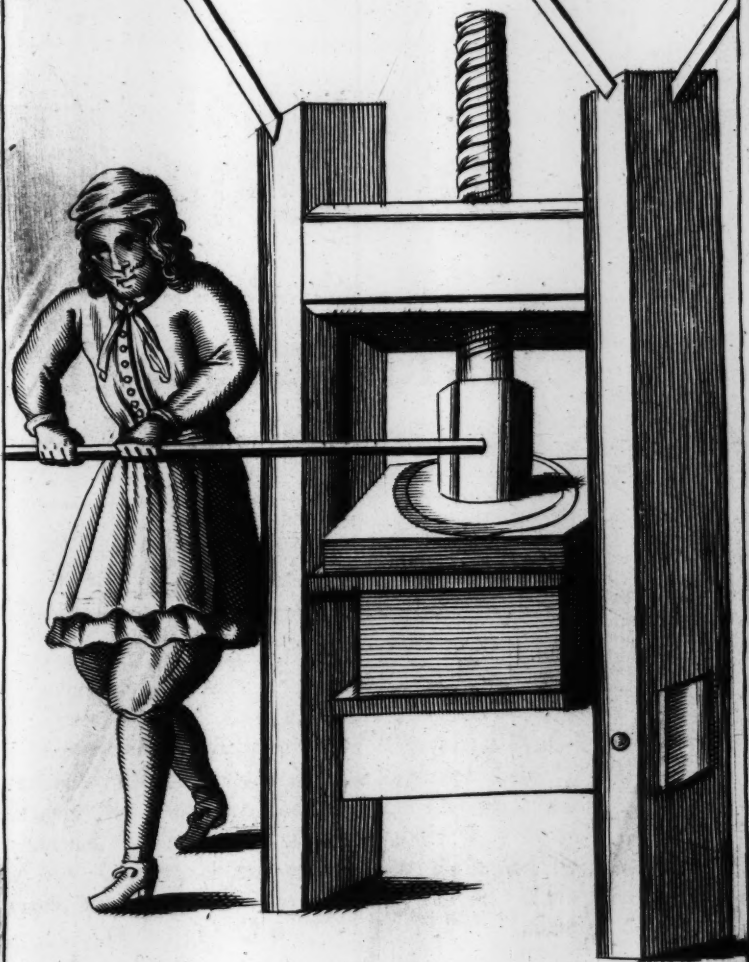
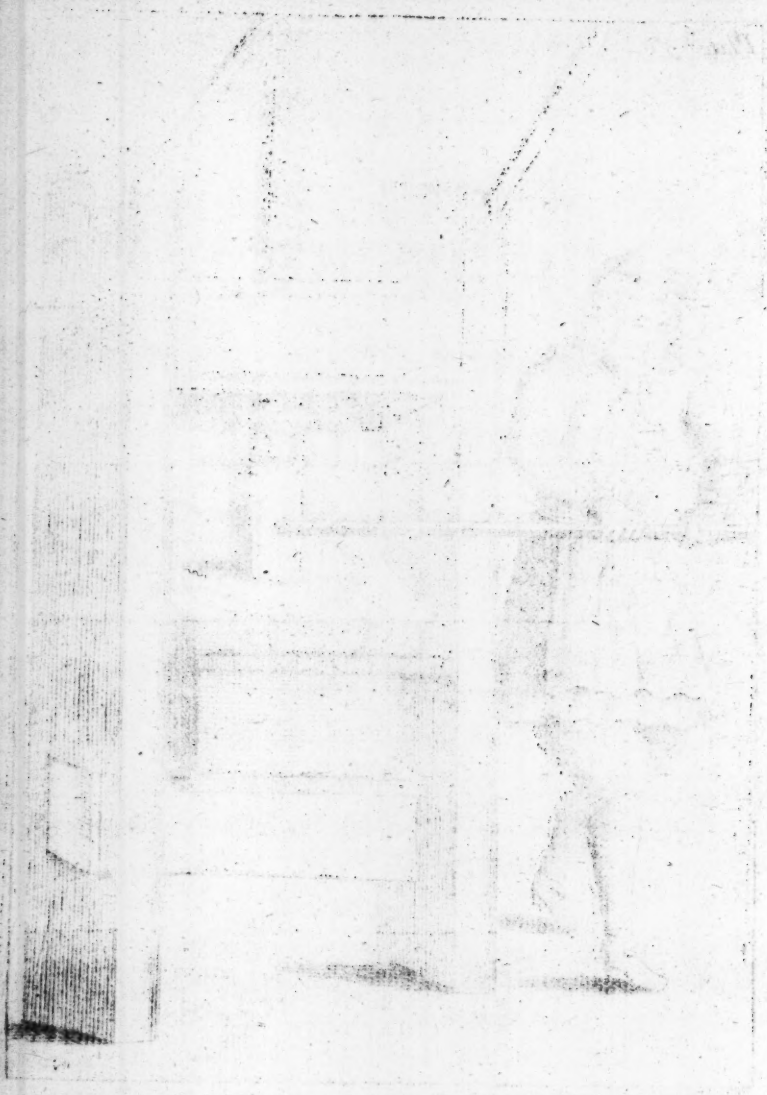


Plate 33.





MECHANICK EXERCISES :

Or, The Doctrine of

Handy-works.

Applied to the

Press-mans Trade.

The Second VOLUME.

P R E F A C E.

THE Printing-Press that a Press-man works at, is a Machine invented upon mature consideration of Mechanick Powers, deducted from Geometrick Principles ; and therefore a Press-man indowed with a competency of the Inventers Genius, will not only find great Satisfaction in the contemplation of the harmonious design and Make of a Press, but as often as any Member, or part of it is out of order, he will know how to remedy any deficiency in it. This alone

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alone will intitle him to be an Understanding Press-man : But his care and serious industry in the Physical and Manual performance of his Task, must give him the Reputation of a good and curious Work-man.

§. 24. ¶ I. Of the Press-mans Trade.

AN understanding *Press-man* therefore knows not only how to direct a Printers Joyner to Set up and Fasten a *Press* when it is made, but also how to give a strange Joyner and Smith instructions how to make a *Press*, and all its parts, in a Symetrical proportion to any unwonted size, if in a strange place he shall have occasion to use it.

I have already at large insisted upon the dimensions of every particular Member of an ordinary siz'd *Press* in § 10, 11. But in those Sections did omit shewing you how the *Press* is Set up and Fastened ; yet promised to do it when I came to the *Press-mans* Trade : It being not only a care incumbent upon him, but a Curiosity he would assume to himself to direct and see the Joyner set and fasten it in a Steddy and practical position. We will suppose a strange Joyner, and not a Printers Joyner (as here in *London* he may be furnisht with) who generally by their constant conversation in Printers work, do or ought to know as much of Setting up a *Press* as the *Press-man* himself.

The Joyner therefore having set together the Frame, viz. the *Cheeks, Feet, Cap, Head, Till, Winter, Hind-Posts, Ribs, Carriage, &c.* The *Press-man* directs, and sees him perform as follows by and by.

by. For I should have told you that before the *Head* is put into its place, the *Press-man* besmears the whole Tennanted ends and Tennants well with Soap or Grease, and also the Mortesses the *Head* slides in, and so much of the *Cheeks* as the ends of the *Head* work against, that the *Head* may the easier work up and down.

He also before the *Carriage* is laid on the *Ribs*, besmears the two edges of the *Plank* and the under side of the *Coffin* well with Soap or Grease; and the like he does by the inside of the *Wooden Ribs*, that they may slide the easier beside each other.

Now to return to the Joyner. The *Press-man*, I say, directs and sees him perform as follows.

1. To place the *Feet* upon an Horizontal Level Floor, as I shewed in the First Volume, Numb. 7. § 7. when I spoke of the Level that Carpenters use.

2. To erect the *Cheeks* perpendicularly upright, as I shewed Vol. 1. Numb. 7. § 8. when I treated of the *Plumb-line*.

3. To place the *Stays* or *Braces* so as the *Press* may be kept in the most Steddy and Stable position, as well to give a check to the force of the hardest *Pull* he makes, as to the hardest Knock the *Bar* shall make against the farther *Cheek*, if by chance (as sometimes it does) it slip out of the *Press-mans* Hand.

This consideration may direct him to place one *Brace* against the end of the *Cap* that hangs over the hither *Cheek*, and in a range parallel with the fore and hind side of the *Cap*: For the more a *Brace*

stands aslope to the two parrallel sides, the less it resists a force offered to the end of them, viz. the hither end of the *Cap*, which is one main *Stay* to the whole *Press*.

If he place another *Brace* against the hinder corner of the farther end of the *Cap*, it will resist the *Spring* of the *Bar*, if it slip out of the *Press-mans* Hand.

And if he places two other *Braces*, one against the hither corner of the hind-side of the *Cap*, and the other against the farther corner of the fore-side of the *Cap*, the *Press* will be sufficiently *Braced-up*, if the Room will afford convenience to place the farther end of the *Braces* against.

By convenience I mean a firm solidity to place the end of the *Braces* against, be it either a *Stonewall*, *Brick-wall*, or some principal *Post*, or a *Girdler*, &c. that will not start or tremble at the force of a *Pull*.

The *Braces* ought to be straight, and of Substance strong enough proportionable to their Length: And if convenience will allow it to be fixed in such a position that they stand in the same straight Line with the upper Surface of the *Cap*, viz. that the farther end of the *Brace* neither dips lower or mounts higher than the upper side of the *Cap*. Neither ought the *Brace*, though thus posited, to stand aslope or askew, viz. make unequal angles with the side of the *Cap* it is fastned to, but it ought to stand Square, and make right angles with the respective side of the *Cap*; because in those Positions the *Braces* best resists the force of continued *Pulls*.

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But though this be by the Rules of Architecture, the strongest, firmest, and most concise method for *Bracing-up* a *Press*, yet will not the Room the *Press* is to stand in always admit of convenience to place the *Braces* thus: Therefore the *Press-man* ought to consider the conveniences of the Room, both for the places to fit the *Braces* to, and the positions to set the *Braces* in; placing his *Braces* as correspondent as he can to these Rules.

If he doubt the crazy make of the *Winter*, he will cause two *Battens* of three or four Inches broad, and a full Inch thick, to be nailed close to the outer sides of the Feet of the *Press*, which will both strengthen the *Winter*, and keep the lower part of the *Cheeks* from flying out, and also hinder the *Press* from working into a twisting Position.

And though I am loath to name the *Under-laying* of the Feet, because at the best it is but a *Botch*, and Subjects the whole *Press* to an unstable position yet because by accident it may happen, the aforesaid *Battens* will also keep these Underlays from working out.

Joyners that Work to Printers have got a Custom to place a strong Piece of Timber between the middle of the *Cap* and the Ceiling or Roof of the Room, which can do no service there, unless they intend to support the Roof: For the weight of the *Press* alone will keep it close to the Floor, and the strength of Stuff between the Mortesses in the *Cheeks* and the ends of them, are intended to be made strong enough to resist the Rising of the *Head*: For should that strength of Stuff start, neither their strong Piece of

Timber, nor the strength of the Roof, would resist the Rising of the *Head*: but *Head* and *Cap*, and Timber and Roof too, would all start together, as by experience I have seen. For indeed the strength of Stuff between the Mortesses that the Tennants of the *Head* works in, and the upper ends of the *Cheeks*, and the Strength of Stuff between the Mortesses that the Tennants of the *Winter* lyes in, and the lower ends of the *Cheeks* resist the whole strength of the working of the *Spindle* out of its *Nut*. So that the *Cap* suffers no pressure upwards or the *Feet* downwards, unless the force of the *Spindle* break the strength of Stuff between the *Head* and the upper ends of the *Cheeks*, or the strength of Stuff between the *Winter* and the lower ends of the *Cheeks*.

The *Press* being thus far fastned, the *Carriage* is laid on; and if the Joyner performed his Work well in making the Wooden-work, it will at first lye exactly Horizontal; if not, it must be mended where it is amiss before the *Press-man* can Lay the *Stone*; and before the *Stay* of the *Carriage* can be fitted under the end of the *Ribs*.

¶ 2. Of Laying or Bedding the Stone.

We will suppose the Wooden *Ribs* to lye on the *Winter* exactly, flat and Horizontal, therefore the *Press-man* now Lays the *Stone*: If the *Stone* be a good thick Marble Stone, and all the way of an equal thickness between the *Face* and the Bottom, he may *Bed* or *Lay* it upon so many large *Sheets* of Brown Paper as will raise the *Face* about a *Brevier*

vier above the Superficies of the *Coffin*, and the *Stone* will do good service.

Or he may *Bed* or *Lay* it on Bran; which indeed the *Press-man* most commonly does, if the *Stone* be qualified as aforesaid.

The manner how he lays it on Bran is thus,

He grasps an handful of Bran and lays it down at the hither corner of the *Coffin* on his Left Hand, and it will form it self into a small Hillock; then he takes another handful of Bran, and lays that down in the same manner near the first, towards the further side, and so a third, &c. towards the further side, till he have filled the whole breadth of the *Coffin*. Then he in like manner lays another row of Hillocks, beginning at the hither side of the *Coffin*; and so a third and fourth row, &c. till the length of the *Coffin* is filled as well as the breadth: Then with a *Riglet* he drives the tops of these Hillocks into the Valleys between them, to spread the Bran into an equal thickness in the whole *Coffin*. Which done, he lays the *Stone* upon it.

But in this case he considers to lay so much Bran thus into the *Coffin* as may make the *Face* of the *Stone* rise about a *Great Primer* higher than the Superficies of the *Coffin*: For else he must take all his Bran out again, and new-lay his Hillocks, making them bigger or less, till he have fitted the *Face* of the *Stone*, to lye about a *Great Primer*, as aforesaid, higher than the Superficies of the *Coffin*.

But if it be a thin *Stone*, or a *Purbeck* or *Portland Stone*, it is great odds if it be thus *Laid*, but it breaks with the first *Pull*: Therefore these *Stones*

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are generally *Laid* or *Bedded* with Plaister of *Paris*, which before it hardens, will of it self run into an Horizontal position.

This Plaister of *Paris* is tempered with fair Water to the consistence of Batter for Pancakes, or somewhat thicker, and such a quantity is put into the *Coffin* as may raise the *Face* of the *Stone* about a Scaboard higher than the Superficies of the *Coffin*.

The different matter the *Stone* is *Laid* on is the reason why the *Face* is *Laid* of different heights above the Superficies of the *Coffin*: For by the force of a *Pull* about a dozen Sheets of Brown Paper may be squeeze'd closer by a *Brevier Body*, which brings the *Face* of the *Stone* into the same Level with the Superficies of the *Coffin*. And Bran squeezes much more. But Plaister of *Paris* not at all.

When he *Lays* the *Stone* on Bran, or on Plaister of *Paris*, he and his Companions slings the *Stone* in two strong Packthreads, placing one towards either end of the *Stone*; and each of them taking an end of each String in each of their Hands, with the *Face* of the *Stone* upwards, and brought as near as they can into an Horizontal Position, they with great care and caution let it into the *Coffin*, and as near as they can, so as the whole bottom of the *Stone* touch the *Bedding* all at once; lest by raking the *Bedding* with any part of the bottom of the *Stone* first, the Horizontal form of the *Bedding* be broken.

Having laid the *Stone* down, they draw the Packthread from under it: And by squeezing a little Water out of a Sponge upon about the middle of the *Face*

of

of the *Stone*, try whether the *Stone* lye truly Horizontal, which they know by the standing of the Water: For if the Water delate it self equally about the middle of the *Stone*, the *Stone* lies Horizontal: But if it have a propensitude to one side more than another, the declivity is on that side, and the *Stone* must be new *Laid*.

Having laid it Horizontal, they *Justifie* it up with the *Justifiers* I mentioned in § 11. ¶ 17.

¶ 3. Of Setting the Rounce.

The *Rounce* being well *Set* does not only ease a *Press-man* in his Labour, but contributes much to Riddance in a train of Work.

In the old-fashioned *Presses* used here in *England*, the *Press-man* finds often great trouble and loss of Time in *Setting* the *Rounce*: Because the *Girts* being nailed to the *Carriage-board* behind, and to the Frame of the *Coffin* before, he cannot alter the position of the *Rounce* without un-nailing and nailing the *Girts* again, both before and behind. Nay, and sometimes though he thinks he has been very careful in *Winding* the *Girts* off or on the *Barrel* of the *Rounce*, as he finds occasion requires; Yet by straining either of the *Girts* too hard, or not hard enough, or by an accidental slip of either of the *Girts*, or by stirring the *Rounce* out of a *Set* position, when he thinks he has *Set* the *Rounce*, he has it to do again. Besides, The *Carriage-board*, *Frame* of the *Coffin*, and the *Rounce-barrel*, all suffer tearing to pieces by often drawing out and driving in o. Nails.

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But in these new-fashioned *Presses* all these inconveniences are avoided, for the *Press-man*, without nailing or un-nailing, *Sets* the *Rounce* to what Position he will, only by lifting up the *Iron Clicker* that stops the wheel: For then *Winding* off so much *Girt*, and *Winding* up so much *Girt* at the opposite end of the *Carriage*, his *Rounce* is *Set*, without hope or Hazzard.

He *Sets* the *Rounce* to such a position, that when the fore-end of the *Tympan* will just lye down and rise free, without touching the fore-edge of the *Plattin*, then a line drawn or imagined from the Axis of the *Handle* of the *Rounce*, to a Perpendicular or *Plumb-line*, let fall from the Axis of the *Spindle* of the *Rounce*, these two lines shall make an angle of about 45 degrees, which is half the Elevation between an Horizontal line, or Line of Level, and a Perpendicular, or *Plumb-line*.

¶ 4. Of Hanging the Plattin.

When the *Press-man* *Hangs* the *Plattin*, he lays a *Form* upon the *Press*, and about a *Quire* of Paper doubled upon it (this *Quire* of Paper thus doubled is called the *Cards*) then layes the *Plattin* upon the *Cards*, and so *Runs* the *Carriage* and *Plattin* in, till the middle of the *Plattin* lye just under the *Toe* of the *Spindle*: Then he puts the *Pan* of the *Plattin* in its place, and in part Justifies the *Head*, as shall be shewed in the next ¶. And he un-screws the *Hose-screws*, till the *Squares* at the ends of the *Hose* come down to about a quarter of an Inch of the Square of the

the Socket they are fitted into in the ends of the *Garter*, and when the *Toe* of the *Spindle* is fitted into the *Nut* in the *Pan* of the *Plattin*, he examines by straining a *Pack-thread* against the two foresides of the *Cheeks* of the *Press*, whether the fore-edge of the *Plattin* is set in a parallel Range with the fore-sides of the *Cheeks*: If it be not, he twists the ends till the edge of the *Plattin* stands parallel with the *Pack-thread*, and consequently with the *Cheeks*.

Then with the *Bar* he Pulls the *Spindle* hard down upon the *Plattin*, and Sets the edges of a *Paper-board* between the *Bar* and the farther *Cheek* of the *Press*, to keep the *Bar* from starting back.

And having provided fine *Whip-cord*, he knots a Noose on one end and puts it over one of the *Hooks* of the *Plattin*, lashing the *Whip-cord* also upon the farthermost *Notch* of the *Hose-book*, and again upon the *Plattin-book*, and again upon the *Hose-book*, and again upon the *Plattin-book*: So that here is now three Lashes of whip-cord upon the *Plattin-book*, and upon the farthermost *Notch* of the *Hose-book*. Wherefore he Lashes his fourth Lashing of whip-cord now upon the second *Notch*, viz. the middlemost *Notch* of the *Hose-book*, reiterating these Lashes on the middlemost *Notch* and *Plattin-book* also three times. And thus in like manner Lashes also three Lashes upon the third and last *Notch* of the *Hose-book* and also of the *Plattin-book*, observing to draw every Lashing of an equal strength.

Then he begins to whip about these Lashings to draw them close together: He begins, I say, at at the bottom of the Lashings, viz. close above the

Plattin-book, and draws his whippings very tight and hard, and contiguous above one another, till he have whipt so near the top of the Lashings, viz. near the *Hose-books* that he finds the Lashings (which now spread wide asunder because the *Notches* of the *Hose-books* stands far asunder) will yield no longer to his whipping and pulling: So that now he fastens his whip-cord with two or three hard knots, and cuts it from the Coyl.

In like manner he begins at the opposite diagonal corner of the *Plattin*, and lashes and whips that: And also the two other corners of the *Plattin* as he did the first, carefully observing to draw all his lashings and whippings of an equal strength, lest any corner of the *Plattin* either mount or dip.

If he finds he strained the whip-cord not hard enough; or (when he is in his train of work) that the *Plattin-cords* with long working work loose; or that the *Toe* of the *Spindle* and the *Nut* it works in, have worn one another; he by turning the *Screws* at the upper ends of the *Hose*, draws up the *Nut* of the *Plattin* closer to the *Toe* of the *Spindle*, and by consequence strains the *Plattin-cords* tighter up; which is also a great convenience in these new-fashioned *Presses*: For, for any of these aforesaid accidents the *Press-man* that works at our *English-Presses* must new Hang his *Plattin*: When (as aforesaid) in these new *Presses* he only turns about a *Screw*.

¶ 5. Of Justifying the Head.

Justifying the Head is to put into the Mortesses in the *Cheeks* between the upper sides of the Tennants of the *Head*, and the upper sides of the Mortesses in the *Cheeks*, an equal and convenient thickness of (either) square pieces of Felt, Pastboards, or Scaboards (some or all of them) that when the *Press-man Pulls*, the Tennants of the *Head* shall have an equal Horizontal level Check.

In *Justifying the Head*, the *Pull* is to be made *Longer* or *Shorter*.

If the *Press-man* be tall and strong and his work be *Light*, that is, a small *Form* and great *Letter*, which needs not so strong a *Pull* as a Large *Form* and small *Letter*, he covets to have a *Short-pull*; that is, that the *Spindle* shall give an *Impression* by that time the *Bar* comes but about half way to the hither *Cheek* (in Printers Language *Down*.)

But if the *Press-man* be low, and not very strong, he will require a *Longer Pull*, especially if the work be *Heavy*, viz. a Large *Form* and small *Letter*: Because the heighth of the *Bar* is generally made to lye at the command of a reasonable Tall man, and therefore a Low man cannot Pull the Handle of the *Bar* at so great a force at Arms-end as a Tall man; but will require the swinging of his whole Body backwards to add force to the *Pull*: So that if the *Pull* be not *Longer*, he cannot fall enough backwards to get the *Handle* of the *Bar* within his command and force. And therefore a Low man and *Heavy Work* requires a long and *Soaking Pull*.

A long or a *Soaking* or *Easie Pull*, is when the *Form* feels the force of the *Spindle* by degrees, till the *Bar* comes almost to the *hither Cheek* of the *Press*, and this is also call'd a *Soft Pull*; because it comes Soft, and Soakingly and easily down: And for the contrary reason the *Short Pull* is call'd an *Hard Pull*, because it is suddenly perform'd.

That which makes a *Hard Pull*, is putting into the *Mortesses* in the *Cheeks* solid Blocks of Wood, which will scarce Squeeze by the Strength of a *Pull*: And that which causes a *Soft Pull* is putting in pieces of Felt or Pastboard (as aforesaid) which being Soft will Squeeze and retain their Spring for a considerable time, yet will at length grow hard with Working, and then the *Pull* grows *Longer*; which the *Press-man* mends, by putting in another Felt or Pastboard into each *Mortess*.

The *Head* cannot be conveniently and well *Justified* soon after the laying of the *Stone*, if it be *Laid* on Bran, because though the Force of the *Spindle* will at the immediate time of the *Pull* Squeeze the Bran in the *Coffin* close, yet so soon as the force of the *Spindle* is off the Bran, all its dry parts, by their several irregular positions, will like so many Springs, at the same moment of time endeavour to recover their Natural tendency, and heaves the *Stone* upwards again: So that generally for a day or two Working the *Stone* will not lye Solid, though at length through the often and constant Squeezing the Bran it will. But if the *Stone* be *Laid* on Brown Paper, or Plaister of Paris, it quickly finds a Solid Foundation.

When the *Press-man* *Justifies* the *Head*, he unscrews

screws the *Female Screws* of the *Head Screws*, that the weight of the *Head* may draw it down, to make room to put the *Justifiers* into the *Mortesses* in the *Cheeks*; and when he has put in so many as he thinks convenient, he *Screws* up the *Head* again as hard as he can. Then lays the *Cards* on the *Form*, on the *Press*, and *Runs* in the *Carriage* under the *Plattin*, and *Pulls* hard upon it, while his *Companion Screws* up the *Head* as hard and tight as he can, that the *Carriage*, *Tympan*, &c. may *Run* the freelier under the *Plattin*.

¶ 6. Of Oyling the Iron Work of the Press.

The *Ribs*, the *Tympan Joynts*, the *Frisket Joynts*, the *Garters*, both ends of the *Rounce-Spindle*, the *Nut* and *Spindle*, and the *Toe* of the *Spindle*, are all to be well Oyl'd; that they may all perform their several offices the easier, lighter and nimbler; both *Upper* and *Under hand*.

All but the *Nut* and *Spindle*, and *Toe* of the *Spindle*, are Oyl'd with a Feather dipt in a spoonful, or little Pot, or Oyster-shell, &c. of Sallad Oyl; and that feather dabb'd upon so much of the *Ribs* as he can come at, at either end of the *Press*: For then by *Running* the *Carriage* three or four times quick *Out* and *In*, it desperes the Oyl equally the whole length of the *Ribs*, and at the same time Oyls the *Cramp-Irons*.

And for Oyling the *Joynts*, he commonly takes out the *Pins* and Oyls them, and puts them in again; and with the edge of a Feather dabs a
little

little Oyl between the Crevices of the *Joynts*.

He thrusts the Feather in between the *Spindle* of the *Rounce* and its *Collers*.

To Oyl the *Nut* and *Spindle*, he pours a good quantity of Oyl in at the *Hole* in the *Head*, and with a *Cork* stops the hole again to keep out dust and filth: Then drawing the *Bar* quick to and fro about half a score times, he works the Oyl equally about the *Nut* and *Spindle*.

To Oyl the *Toe* of the *Spindle*, he pours about a Spoonful of Oyl into the *Plattin-pan*.

¶ 7. Of Making Register, and Making Ready a Form.

A curious *Press-man* will take care that against the *Compositer* brings a *Form* to the *Press* his *Press-stone* be wip'd very clean; for if any (though small) hard extuberant matter lye on it, the *Letter* that lyes on that extuberant matter will, with *Pulling*, quickly *Rise*, and not only Print harder than the rest of the *Form*, but bear the force of the *Plattin* off of the *Letters* adjacent to it. And therefore many times a *Press-man* will receive the *Form* from the *Compositer* when he has only Set the *Form* on the side of its *Chase* upon the *Press-stone*, that he may be the Surer the *Face* of the *Stone* is clean when he layes the *Form* down; as also that he may carefully examine that the backside of the *Form* is clean before he goes about to make *Register*, or otherwise make ready his *Form*.

Making Register is to *Quoin* up a *Form* and otherwise alter *Whites* (if need be) between the *Crosses* and *Pages*: So as that when a second *Form* of the same

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Volume, Measure and Whites, is plac'd in the same position, all the Sides of each *Page* shall fall exactly upon all the Sides of the *Pages* of the first *Form*.

The first process a *Press-man* makes towards this Operation, is the chusing and placing of his *Points*: For to large Paper he chuses *Short Shank'd Points*, and to small Paper *Long Shank'd Points*, and proportionable to intermediate sizes of Paper: For his *Points* ought to be placed so as that when he is in his Train of work, they prick the *Point-holes* within the grasp of the hollow between his hand, Thumb, and Fore-finger; because when he shall Work the *Reteration* he may the better manage and Command the sheet he lays on the *Tympan* and *Points*.

Nor will he place his *Points* too near the edge of the *Paper*, because when he Works the *Reteration*, he would be forc'd to carry his furthest *Point-hole* the further from him, which in a long train of Work loses Time: For the *Laying Sheets* quickly on their *Point-holes* adds much to riddance. So also the less distance between the further and hither *Point-hole* makes more riddance than if they are far distant; because he must draw his Body so much the further back to place that *Hole* on its *Point*. Therefore he places the hither *Point* farther into the Paper than the farther *Point*, if it be *Folio*, *Quarto* or *Octavo*, but to *Twelves* equally distant from both edges of the Paper.

By placing the *Points* unequally from the edges of the Paper, as in *Folio's*, *Quarto's* and *Octavo's* (as aforesaid) he also secures himself the more from a *Turn'd Heap* when he works the *Reteration*; be-

cause without very much altering the *Quoins*, he shall not be able to make *Register*: And *Press-men* (especially if they Work upon the same sort of Work) seldom or never remove the *Quoins* on the further side the *Carriage*, nor on the right hand end of the *Carriage*, but let them lye as gages for the next *Form*: For thrusting the *Chase* close against these *Quoins*, the *Register* is almost (if not quite) made: The *Compositer* having before, according to his Task, chosen the *Chases* exactly of an equal size, and made strait and equal *Whites* between the *Crosses*, &c.

Having chosen his *Points*, he places them so that they may both stand in a straight line parallel with the top and bottom sides of the *Tympan*; which to know, he strains a Packthred cross the whole *Tympan*, laying it at once upon the middle of the *Heads* of both the *Point-Screws*, (for we will suppose the Joyner hath made the *Mortesses* into which the *Point-Screws* are Let, parrallel with both the ends of the *Tympan*) then if both the *Points* stand in that straight line they are parrallel, if not, he moves one or both of them upwards or downwards till they do, and then *Screws* them fast.

Then he layes the *Tympan* down upon the *Form*, holding the *Frisket-end* of it in his Left-hand, about an Inch or an Inch and a half above the *Face* of the *Letter*, and Sinks his Body downwards till he can see between the *Form* and *Tympan*, and with the Ball of the middle finger of his Right-hand presses a little gently upon the *Tympan* just over the *Point-ends* of each *Point* successively, to see if the *Points* fall in or near the middle of the *Slits* in the
Short-

Short-Cross. If they fall exactly in the middle of those *Slits*, the *Form* lyes right between the middle of both the ends: If they fall not exactly in the middle of both these *Slits*, he moves the *Form* between the ends of the *Carriage*, till they do, and then *Quoins* up the two ends of the *Chase*.

Then laying the *Tympan* flat down upon the *Form*, he layes the *Blankets* in it: (They are call'd the *Blankets* though generally it is but one *Blanket* doubled :) Then he puts the *Iron-Pins*, fastned through the hither side of the *Inner Tympan* into the Holes made through the hither side of the outer *Tympan* for Gages: And turning about the Tongues of the *Iron-Buttons*, that are fitted into the outer Side of the outer *Tympan* over the upper Side of the *Inner-Tympan*, he Screws the *Button* fast down. He also Screws down the *Iron-Button* at the end of the *Tympan*. These *Buttons* thus Screwed down are to keep the *Inner-Tympan* fast in, that it Spring not upwards.

Then he Folds a sheet of the Paper he is to Work long-ways, and broad-ways, and lays the long Crease of it upon the middle of the *Long-Cross*; and the Short Crease over the middle of the *Gutters* of the *Short-Cross*, if the *Short-Cross* lye in the middle of the *Form*, (for in *Twelves* it does not, but then he guesses at the middle;) then wetting his *Tympan* (as shall in proper place be shewed) he turns it down upon the Paper, and *Running in* the *Carriage*, *Pulls* that Sheet, which with the force of the *Pull* now the *Tympan* is wet, will stick to the *Tympan*; and turning up the *Tympan* again sees how well the Sheet was laid; that is, how even it was Laid: For

if it was laid evert on the *Form*, the *Margin* about the out sides of all the outer *Pages* will be equal ; But if the Sheet be not laid even, he lifts it up Side by Side till he have loosen'd it from the *Tympan*, and removes it by his discretion till it be laid even : And then *Pulls* again upon it to fasten it to the *Tympan*. This Sheet is call'd the *Tympan-sheet*.

Then he lays another Sheet even upon the *Tympan-sheet*, for a Register Sheet, and a Waste Sheet over that to keep it clean from any filth the *Face* of the *Letter* may have contracted and imprint upon it, and *Pulls* these two Sheets. Then he *Runs out* the *Carriage*, and takes up the *Tympan*, and takes off the two Sheets, laying the waste Sheet by : But turns the other Side of the *Register-Sheet* the proper way his Volumne requires, *viz.* end-ways if it be *Octavo* or *Folio* ; or Side-ways if *Twelves* or *Quarto*, &c. as at large you see in the Section of *Imposing*. And laying the *Point-holes* in the *Register-Sheet* over the *Points*, lays his waste Sheet on again, *Runs-in* the *Carriage*, and *Pulls* upon that the Second side of the *Register-sheet*, to-try how well the Impression of the Sides of all the *Pages* agree, and lye upon the Impression in the first *Pull'd* Side. If he finds they agree perfectly well, *Register* is made. But if the Impression of the last *Pull'd* Side of the *Register-sheet* stand-be-hither the Impression of the first *Pull'd* side, either the whole length of the Sheet or part, he observes how much it stands be-hither : If the thickness of a *Scaboard*, a *Nomparell*, a *Long-Primmer*, &c. he loosens the *Quoin* or *Quoins* on the farther side of the *Carriage*, and opens one or both of them, *viz.* re-
moves

moves them backwards till they stand a *Scaboard*, a *Nomparell*, a *Long Primmer*, &c. off the sides of their respective *Corners*: Then *Knocks* up one or both the opposite *Quoins*, till he have removed the *Chase*, and the *Chase* by consequence has forc'd the opened *Quoin* or *Quoins* close against their *Corners*. Or if the *Impression* of the last *Pulled Side*, stands within the *Impression* of the first *Pulled Side*; he observes how much also; and Loosning the hither *Quoin* or *Quoins*, and *Knocking up* the opposite as before, makes *Register*, for the *Sides* of the *Sheet*.

Then he observes how the *Register* of the *Head* and *Foot* agrees. And if he finds it agrees on both sides the *Short Cross*, he has good *Register*; supposing the *Compositer* has performed his Office, viz. made all his *Pages* of an equal Length, &c.

If the *Impression* of the Last *Pulled Sheet*, lye without the *Impression* of the first *Pulled Sheet*, towards the upper or lower end of the *Tympan*, he opens the *Quoins* at the respective end, and *Knocks up* the opposite till he have made *Register*: Which to try he *Pulls* another clean *Register-sheet* as before. And if he finds *Register* agree on all the *Sides* of the *Form* the Task is performed: If not, he mends as aforesaid till it do.

But it sometimes happens that the *Compositer* has not made an exact equal *White* between all the sides of the *Crosses*: In this case, altering the *Quoins* will not make good *Register*; wherefore the *Press-man* observes which side has too much or too little *White*; and unlocking the *Form* takes out or puts in such a number of *Scaboards* as he thinks will make good

Register : which he tryes by *Pulling* a Sheet, and if need be, mending as before, till he have *Pull'd* a Sheet with good *Register*.

Although the *Press-man* have made *Register*, yet he must further *Make Ready* the *Form* before he can go to Work upon it. Under this phrase of *Making Ready the Form* is comprehended many Considerations, leading to several various Operations ; For first, The *Frisket* must be *Cut* : which to perform, the *Press-man* fits the *Match-Joynts* of the *Frisket* into the *Match-Joynts* of the *Tympan*, and pins them in with the *Frisket-pins*: And having *Beaten* the *Form*, turns down the *Frisket* and *Tympan* on the *Form*. And having also Rubbed the *Blankets* to soften them, lays them smooth and even in the *Outer-Tympan*, and Pins the *Inner Tympan* in upon them, as was shewed in the beginning of this ¶, and Pulls as before, and as shall farther be shewed in ¶ 15. upon the bare *Frisket*.

Then he *Runs out* the *Carriage*, and takes up the *Tympan* and *Frisket* together off the *Form* and lays them on the *Gallows* ; Then takes the *Frisket-pins* out again, and takes off the *Frisket* : And laying it flat on a *Paper-board*, with the point of a Pen-knife cuts through the *Frisket* about all the Sides of each *Page*, allowing to each *Page* he thus cuts out of the *Frisket* about a *Nomparil Margin* on all the sides of the cut cut *Pages* : Then he puts and pins his *Frisket* again on the *Tympan*, as before.

2dly, He takes care that the *Tympan* be well *Wet* ; which he does by squeezing Water out of a *Sponge* on the backside of it, till it be well *Wet* all over, and well soak'd and limber.

3dly,

3dly, That the *Form* be well and fast *Lock'd up*.

4thly, That no *Letters* or *Spaces* lye in the *White-lines* of the *Form*; which may happen if the *Compositer* have *Corrected* any thing since the *Form* was laid on the *Press*, and the *Compositer* through oversight pickt them not all up.

5thly, If any *Wooden Letters* or other *Cuts* be in the *Form*, that they be exactly *Letter-high*: If not, (for it seldom happens they are) he must make them so; If they are too *Low*, (as they generally be) he *Under-lays* them: But first He examines how much they are too *Low*, by laying one *Card* or one *Scaboard* or two *Scaboards*, or a *Scaboard* and a *Card*, &c. upon the *Face* of the *Wooden Cut*, and gently feeling with the *Balls* of the *Fingers* of his right *Hand* if the intended *Under-lay*, viz. the *Scaboard*, *Card*, &c. lye exactly even with the *Face* of the *Letter*, If it do not, he tries thicker or thinner *Under-lays* till he have evened the *Under-lay* with the *Face* of the *Letter*: For then the *Balls* of his *Fingers* will go smoothly and equally over the *Under-lay* and the *Face* of the *Letter*, as if they were one and the same *Superficies*.

Having evened his *Under-lay*, he *Unlocks* that *Quarter* it is in, and takes the *Wooden Cut* out of the *Form*, and cutting a *Scaboard* or *Card* or what it wants a little smaller than the bottom of his *Wooden Cut*, he lays it into the place he took the *Wooden Cut* out of, or else he *Pasts* the *Under-lay* on the bottom of the *Wooden Cut*, and puts the *Wooden Cut* into its place again upon the *Under-lay*. But yet he trusts not to his *Judgment* altogether for the thick-
ness.

ness of the *Underlay*: But *Locking up* the *Form* again, *Pulls* the *Cards* upon it to sink it as low as it will go, and *Beats* and *Pulls* a *Sheet* to see how it pleases him. If it be too low, which he finds by the *Pale* *Printing* of it, he *Underlays* it a little more, and again tries by *Printing* till it pleases him. But by no means he lets the *Cut* stand too high, though but a small matter, For then it will *Print* too *Hard* and too *Black*, and deface the beauty and fairness of the *Cut*; So that it may better stand about half a *Card* too low, than in the least too high.

If the *Wooden Cut* be too high, he causes a *Joyner* to *Plain* off some at the bottom.

6thly, If a *White Page* or *Pages* happen in a *Form*, and he uses a *New-drawn Frisket*, then he does not *Cut out* that *Page*: But if he *Work* with an *Old Frisket*, and that *Page* is already *Cut out*, he *Sews*, or sometimes *Pastes* on a *Scaboard*, if the *Page* be not too broad, or a strong *Pasteboard* to the *Sides* and *Crosses*, to cover the *White-page* in the *Form*, that it *Print* not *Black*.

If the sides of the *Pages* adjacent to the *White-page* *Print Hard*, as most commonly they do, because the *White-page* is generally lower than *Letter* high, so that the force of the *Spindle* squeezes the yielding *Paper*, *Tympan* and *Blankets* below the *Plain* of the *Face* of the *Letter*; and besides the force of the *Spindle* falling upon the center of the *Plattin*, and the *Plain* of the *Plattin* not finding resistance to entertain it equally, presses lower down upon the low *White-page*, than upon the *Face* of the *Letter*; so that the *Press-man* either *Underlays* the *White-page*,

page, as he does *Wooden Cuts*, or else he fits a *Bearer* on the *Frisket*.

The *Bearer* is a *Riglet* of a convenient thickness : and this convenient thickness the *Press-man* finds as I shewed you how he found the thickness of his *Underlays* for *Wooden Cuts* ; only with this difference, that as then he made his *Wooden Cut* exactly *Letter-high*, so now he makes his *Bearer* and the *Furniture* his *Bearer* bears on *Letter-high* : Wherefore he Pasts one side of his *Bearer*, and lays it as he would have it on the *Furniture*, with the Pasted side upwards ; and laying his *Tympan* and *Frisket* down upon the *Form*, with his Fingers presses on the outside the *Inner-Tympan Frisket* and all, upon the place where the *Beares* lies ; So that with the Paste the *Bearer* sticks to the side of the *Frisket*, which he takes up again : and if he thinks the Paste not strong enough to hold it till the *Form* is wrought off, he sews it to the *Frisket* by pricking his Needle on both sides the *Bearer*, and lashing the Thred over it so often till he thinks it fast enough sew'd on.

7thly, He examines whether the *Frisket Bites* not : That is, whether no part of it Print upon any of the sides of any of the *Pages* : if they do he cuts away so much and about a *Nomparel* more off the *Frisket* where it *Bites*.

8thly. He examines if the *Beards* of the *Letter* Print at the Feet of the *Pages* : If they do, He considers whether the too short or too far *Running* in of the *Carriage* causes it. Or whether it be only the *Beard* of a short *Page* that Prints ; If it be the *Beard* of a short *Page* that Prints, he remedies it with an

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Under-lay as I shewed he did in the *White Page*.

If the *Carriage* be *Run* in too short, and the *Feet* of the *Pages* stand towards the *Plattin*, the *Hind-side* of the *Plattin* will press strong upon the *Feet* of those *Pages*: And if the *Carriage* be *Run* in too far, the *Feet* of the *Pages* that stand towards the hinder *Rail* of the *Tympan* will most feel the force of *Plattin*, and according to a greater or less proportion of that force, and to the softness or yielding of the *Paper*, *Tympan*, and *Blankets*, and all other *Springs* in the *Press*, mentioned in §. II. ¶ I. of this *Volume*, the *Feet* of the *Pages* and *Beard* of the *Letter* will more or less *Print Hand*.

Wherefore in this case he *Runs* the *Carriage* under the *Plattin*, till the farther *Edge* of the *Plattin* just cover the *Feet* of those *Pages*, and with a piece of *Chalk* makes a *White stroke* over the *Beard* of the hither side of the *Carriage* behind, and the upper side of the *Rail* of the *Ribs*: Then he *Runs* in the *Carriage* again, till the *Fore-side* of the *Plattin* just cover the *Feet* of the *Pages* next the *Hind Rail* of the *Tympan*, and makes another mark with *Chalk* on the *Rail* of the *Ribs* to joyn with the mark he first made on the *Board* of the *Carriage*. Then he *Runs* out the *Carriage*, and lays the *Tympan* down on the *Form*; and *Runs* in the *Carriage* again till he joyn the mark or line he made first on the *Carriage-board* and *Rail* of the *Ribs*, and makes a mark with *Chalk* on the farther *Rail* of the *Tympan* just range with the *Fore-side* of the *Plattin*. This mark on the *Tympan* shews him how far he must *Run* the *Carriage* in against the *Fore-edge* of the *Plattin* for the *First Pull*. Then he

Runs

Runs in the Carriage farther, till he joyn the same Mark or Line on the Carriage-board to the second Mark he made on the Rail of the Ribs, and makes another Mark on the further Rail of the Tympan just range with the Fore-side of the Plattin, for the Mark he is no Run the Carriage in to against the Fore-edge of the Plattin, for his Second Pall.

9thly, He Examines if the Catch of the Bar will hold the Bar when the Spindle makes a small Spring, viz. When the Bar flies but a little way back from the pressure of the Form: If it will not, he knocks up the Catch a little higher till it will, and then Screws the Screw on the Shank, and consequently the Catch close and firm against the Cheek of the Press.

But if the Catch stand too high, so that it will not without a great Spring, (viz. when the Bar is Pull'd hard from the farther Cheek) fly up; He then knocks upon the top of the Catch to sink it lower; And when it is well fitted Screws it up again, as before.

If the Catch of the Bar stand too Low, it will not hold the Bar; But it will Come down again of it self when he is in his train of Work: For if, as it often happens, he lets the Bar fly harder than ordinary back, or if it slip out of his Hand, it will knock hard against the Cheek, and Spring back again.

If the Catch of the Bar stand but a little too High, the Violence of the Bars flying back to make it stick on the Catch will soon Loosen the Square of the Bar in the Eye of the Spindle; and indeed subject the whole Press to an unsafe condition.

This is another ease and convenience these New-fashioned Presses gives the Press-man: For in the Old

make of the *Press*, when the *Catch* of the *Bar* holds too hard, or too soft, he is troubled to Raise or Sink the *Catch* with the thickness of *Scaboards*, which being indevisable, does not without trouble or luck justen it to an exact Height. And besides, These *Under-lays* being but put under the *Catch* upon the *Wooden Bearer* without any Fastning, are very subject to work out by the constant disturbance the motion of the several Parts of the *Press* (when at work) gives it : Or else (which is worse) he many times is forced to batter the *Cheek* of the *Press*, with drawing and driving of Nails out and in it, to fit on another *Catch* bigger or lesser, whereas here with a foster or an harder knock of the Hammer (as aforesaid) he Raises or Sinks the *Catch*, and afterwards Screws it firmly up.

10thly, He considers whether the *Stay* of the *Frisket* stands neither too forwards or too backwards. The *Stay* may stand too forwards, though when it is leisurely turn'd up it stays the *Frisket* : Because, when the *Press-man* is in a Train of Work, though he generally throws the *Frisket* quick up with an accustomed, and as he intends, equal strength ; yet if his guess at strength in throwing it up varies, and it comes (though but a little) harder up, the *Batten* fastned on the *Cap*, and the Perpendicular *Batten* fastned to the aforesaid *Batten* (as is described in §. 11. ¶ 21. of this Volumn) will by their shaking cause a Spring, which will throw the *Frisket* back again upon the *Tympan* : Nay, though (as sometimes it happens) a solid Wall serves to do the Office of a *Stay* for the *Frisket* ; yet with a little too hard throwing it up, the

the *Frisket* it self will so shake and tremble (its Frame being made of thin Iron) from end to end, that e're it recover rest, its own Motion will by the quick running of a Spring through it beat it back again.

If the *Stay* stand too backward, then after he has given the *Frisket* a Touch to bring it down, it will be too long e're it come down, and so hinder his Riddance.

Therefore he places the *Stay* so, that the *Frisket* may stand but a little beyond a Perpendicular backwards, that with a near-guess'd strength in the tossing it up it may just Stand, and not come back; For then with a small Touch behind, it will again quickly come down upon the *Tympan*.

11thly, He considers the Scituation of the *Foot-step*, and that he places so as may best suit with his own Stature; For a Tall man may allow the *Foot-step* to stand farther off and lower than a Short, because his Legs reach farther under the *Carriage*, and can tread hard to add strength to his *Pull*; when a Short man must strain his Legs to feel the *Foot-step*, and consequently diminish the force of his *Pull*.

12thly, He fits the *Gallows*, so that the *Tympan* may stand as much towards an upright as he can: Because it is the sooner clapt down upon the *Form* and lifted up again. But yet he will not place it so upright, but that the White Sheets of Paper he lays on it may lye securely from sliding downwards: And for *Reteration* Sheets their lying upon the *Points* secures them.

In these New-fashioned *Presses* there is no trouble to place the *Gallows*, so as it may mount the *Tympan*.

to any Position : For sliding the *Male-dustails* made on the *Feet* of the *Gallows* through the *Female Dustails* fastned on the *Planck* of the *Carriage*, performs this great trouble that in our English *Presses* requires Unnailing the *Studs* of the *Gallows* and Nailing them again; and many times tearing them and the *Carriage-Planck* to pieces : And that so oft as the fancy of the *Press-man* alters, or another Work-man comes to Work at that *Press*.

13thly, Few *Press-men* will Set the range of the *Paper Bench* to stand at right angles with the *Plank* of the *Carriage* : But draws the farther end of the *Paper Bench* so as the hither side may make an Angle of about 75 Degrees (more or less) with the hither side of the *Carriage* : The reason is, if the hither side of the *Paper Bench* stand at right Angles with the hither side of the *Carriage*, he must carry his Hand farther when he *Lays out Sheets* which would hinder *rid-dance* : Besides his *Companion* has a nearer access to it, to look over the *Heap*; which he frequently does, to see the constant Complexion of the Work.

14thly, The *Press-man* brings his *Heap* and Sets it on the hither end of the *Paper Bench* as near the *Tympan* as he can, yet not to touch it, lest it stop the *Tympan* in a train of Work : and he places an end of the *Heap* towards him. Then taking off the *Paper-board* that cover'd it when it was *Press'd*, he lays the long sides of it parallel to the sides of the *Paper Bench* : Then he takes the uppermost Sheet (which as you may Remember is a Waste-sheet) and lays it on the empty *Paper-board* ; And taking Three or Four or Five *Quires* off his *Heap* in both his Hands, he

he lifts it a pretty height above his Head, and claps it as hard as he can down upon the rest of the *Heap*, to loosen the Sheets that with Pressing stick close together : And not thinking them yet loose enough, he thrusts them long-ways and side-ways, heaving and huffing them till he think he has pretty well loosen'd or hollow'd that quantity of Paper.

Then with the nail of his Right Hand Thumb, sloaping from his Thumbward, he draws or slides forwards the upper Sheet, and two or three more commonly follows gradually with it, over the hither edge the *Heap*, to prepare those Sheets ready for him to match off the *Heap*.

15thly, He considers if the *Face* of the *Tympan* be moist enough, for a *Tympan-sheet* to stick to, for though he Wet the back-side of it before to supple it, yet if the *Tympan* be strong, the Water will not soak quite through to moisten the *Face*, So that he wets the Sponge in fair Water, and besprinkles the upper side or *Face* of the *Tympan* all over : And squeezing the Water that is left in the Sponge well out again, rubs it quickly and gently all over the *Face* of the *Tympan*, to drink up or lick off the body of Water that he besprinkles on, and only leaves moisture on the *Face* of the *Tympan* to hold the Sheet.

Here accrews now a benefit by the make of these New-fashioned *Presses* to the Master *Printer* : For these *Presses* having a *Gutter* fastned to the *Hind-rail* of the *Carriage* (as was described in § 10. ¶ 9. of this Volume) to receive the Water that falls from the *Tympan*, and to convey it beyond the farther side of the *Press*, secures the *Blank* of the *Carriage* from

from Wet and moisture, and consequently from that cause of Rotting.

Then he takes a Sheet of Paper off the *Heap* for a *Tympan-sheet*, and Folds it exactly into four quarters, and lays the Creases of the Sheet exactly upon the middle of the *Short* and *Long Crosses*, if the *Volume* of the *Form* allows them both to be in their respective middles of the *Chase*; if not, he lays the Creases exactly against the Notches in the *Chase* that are made for them respectively: And if his *Frisket* be Blackt with former Work, he lays a Sheet of Waste-Paper upon the Creast-sheet: Then lays the *Tympan* down on the *Form*, and *Pulls* on these two Sheets, and takes up his *Tympan* again, and lays by the Waste-Sheet; but the Creast-Sheet he lays on the *Tympan*. But first presses the *Tympan* downwards, from under the Shank of each *Point* successively, puts the two opposite sides of the Sheet under the *Shancks* of the *Points*, and the *Holes* the *Points* prickt with *Pulling* exactly under the bottom Revits of the *Points*: Then taking a little Paste on the Ball of one of his fingers, a little besmeares the under corners of that Sheet, and claps them down close on the *Tympan*, that the Sheet may stick: But the bottom corner of that side the Sheet that is next to him, he besmeares within the Matter of the Sheet, viz. within the Impression the *Form* made. For when he has fastned that corner down, he tears off the *Margin*, (by guess) in a straight line athwart the very corner, that it may not lye in his way to catch at as he *Takes off Sheets*, when he is in his train of Work.

This Sheet is called the *Tympan-sheet*; and is only
as

as a standing mark to lay all the other Sheets exactly even upon, while he Works upon *White-paper*.

The *Press-man* does now suppose he has *Made Ready*: Yet for assurance he will try his *Register* once more, lest some of the *Quoins* should have slipt. How he made *Register* I shewed you before, wherefore if his *Register* be not good, he mends it as I there shewed. But we will suppose it now good, wherefore he gently *Knocks* up all the *Quoins* in the corners, with an equal force to fasten them.

Though I have in Numerical order set down these Operations, Circumstances and Considerations in this ¶: yet does not the *Press-man* oblige himself to observe them in this or any other orderly succession: Because it often happens that some of these Operations may more readily be performed out of this or any other prescribed Order.

¶ 8. Of Drawing the Tympan and Frisket.

Drawing the *Tympan* or *Frisket* is the Covering and Pasting on of Vellom, Forrels or Parchment upon the *Frames*. To each *Tympan* and *Frisket* is chose a Skin large enough to cover and lap about the *Frames*.

These Skins the *Press-man* rumples up together, and puts them into a Pail of fair Water to soak; and if he thinks they do not soak fast enough, he takes them and rubs them between his Hands, as Women wash Cloaths, to supple them, that the Water may Soak the faster in. And being thoroughly Soakt he wrings the Water as well out as he can.

Then the Boy having provided a Brush and about

a Pint of Paste, made of fine Wheaten Flower, well boiled in fair Water to the consistency of Hasty-pudding, he spreads the Skin flat upon a Table; and first Pastes the under Side of the *Tympan*; then lays it on the middle of the Skin, and rearing each side successively up, Pastes the Skin also from the insides the *Tympan* to the outer edges of the Skin, and lays the *Tympan* down flat again: Then he Pastes all the other sides of the *Tympan*, and wraps the Skin about the two long Sides first, Cutting the Sides of the Skin away so much, till he leaves only enough to reach almost quite through the under-sides of the *Tympan* again: Then drawing and straining the Skin tighter, he drives in the points of two-penny or three-penny Nails about six Inches distant from one another, to keep the Skin from starting as it Dries.

Having thus Drawn the sides, he with the Point of a Pen-knife cuts square holes in the Skin, just where the *Iron-Joynts* fall, for the Joynts to fall into, and Draws and Strains the ends of the *Tympan* as he did the Sides; wrapping the ends of the Skin under the under-sides of the *Tympan*, and where Wood is, drives in the points of Nails, as before.

Then setting it by to dry; when it is dry, he draws the Nails.

As he Drew this *Tympan*, so he Draws the other: and the *Frisket* also: only, because he cannot drive in Nails, (the *Frisket* being all made of Iron) he doubles the Skin over the sides of the *Frisket*, and being well Pasted, as aforesaid; he Sews the sides that Lap over down upon the whole Skin, to keep it from starting while it dries: And he Pastes a Sheet

or

or two Thick of Paper all over the inside of it ; as well to strengthen as to thicken it.

¶ 9. *Of Wetting Paper.*

Paper is commonly *Wet* in a Tray full of fair Water. The *Press-man* places the length of the Tray before him ; his dry *Heap* on the Left Hand the Tray, and a *Paper-Board* with its Breadth before him on his Right Hand of the Tray : He lays first a Waste Sheet of Paper on the *Paper-board*, lest the Board might Soyl or foul the first Sheet of the *Heap*. Then he takes up the first *Token*, and lays it in such a position that the backs of the *Quires* lye towards his Right Hand, that he may the readier catch at the Back of each *Quire* with his Right Hand, when he is to *Wet* it : And he lays that *Token* athwart, or somewhat Crossing the rest of the *Heap*, that he may the easier know when he has *Wet* that *Token*.

Then taking the first *Quire* of the *Heap* with the back of it in his Right Hand, and edge of the *Quire* in his Left, he lays the *Quire* down upon the Waste Sheet, so, as that the back of the *Quire* lye upon the middle crease of the Waste Sheet, and consequently one half of the *Quire* already laid even down upon one half of the Waste Sheet. If the Paper be Strong, he opens about half the *Quire*, and turns it over dry upon the other half of the Waste Sheet : But if the Paper be Weak and Spungy, he opens the whole *Quire*, and lays that down Dry.

The reason why he lays the first Laying-down Dry, is, because it lying under the rest of the *Heap*

will sufficiently imbibe the moisture that Soaks from : And the reason why he leaves but half a Quire Dry for strong Paper, and an whole for Spungy, is, Because Spungy Paper Soaks in moisture faster than Strong.

Having laid down his Dry Laying, he takes another Quire off the Dry *Heap*, with the back of the Quire in his Right Hand, and the edge of the Quire in his Left, (as before,) and closing his Hand a little, that the Quire may bow a little downwards between his Hands, he Dips the back of the Quire into his Left Hand side of the Tray of Water : And discharging his Left Hand of the Quire, Draws the Quire through the Water with his Right ; but as the Quire comes out at the Right Hand side of the Tray, he nimble catches the edge of the Quire again in his Left Hand, and brings it to the *Heap*, but by lifting up his Left Hand bears the under side of the Quire off the Dry Paper, laid down before, lest the Dry Sheet should stick to the Wet, before he have plac'd the Quire in an even position, and so perhaps wrinkles a Sheet or two, or else put a Dry Sheet or two out of their even position, on the sides or ends.

But this Drawing the Quire through the Water he performs either nimble or slowly : If the Paper be Weak and Spungy, he performs it quickly ; if Strong and Stubborn, slowly.

To place this Quire in an even position, he lays the back of the Quire exactly upon the opening crease of the former Quire, and then lets the side of the Quire in his Left Hand fall flat down upon the *Heap* ; and discharging his Right Hand, brings it to the
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the edge of the *Quire*; and with the assistance of his Left Hand Thumb (still in its first position) opens or divides either a third or half of the whole *Quire*, according to the quality of the Paper, (as was said before,) and spreading the Fingers of his Right Hand as much as he can through the length of the *Quire*, turns over his opened division of the *Quire* upon his Right Hand side of the *Heap*.

The reason why he spreads the Fingers of his Right Hand as much as he can through the Length of the *Quire*, is, because the outside Half Sheet is Wet, and consequently quickly Limber, so that if the Paper be Weak, it would fall Down before the rest of his Opening, and double into wrinkles, which thus spreading his Fingers prevents.

In the same manner he Wets all the *Quires* of his Dry *Heap*. See Plate 29.

But having Wet his first *Token*, he doubles down a great corner of the upper Sheet of it on his Right Hand, so as the farther corner may lye a little towards the Left Hand of the crease in the middle of the *Heap*, and so as the hither corner may Hang out on the hither side of the *Heap* about an Inch and an half: This Sheet is called the *Token-Sheet*, as being a mark for the *Press-man* when he is at Work to know how many *Tokens* of that *Heap* is *Wrought-off*, and consequently to know how many is to Work.

When he has Wet the first *Token*, he removes the next uppermost Dry *Token* askew on the Dry *Heap*, and successively all the rest, as I shewed in the beginning of this ¶.

Having Wet the whole *Heap*, he lays a Waste

Sheet of Paper upon it, that the *Paper-Board* to be laid on, Soyl not the last Sheet of the *Heap*: Then three or four times takes up as much Water as he can in the hollow of his Hand, and throws and sprinkles it all over the Waste-sheet that it may moisten and Soak downwards into the un-wet upper part of the last Division of the *Quire*.

The Paper being thus Wet, he takes up the whole *Heap* upon the *Paper-board*, and sets it by in a convenient place of the Room, and lays another *Paper-board* upon it: And upon the middle of the *Paper-board*, sets about Half an Hundred Weight, and lets it stand by to press, commonly till next Morning: For *Press-men* generally Wet their Paper after they have left Work at Night.

The manner how Paper is Set out, shall be shewed when I come to the Office of the *Warehouse-keeper*.

¶ 10. Of Knocking up the Balls.

Ball Leathers (as I said before in § 11. ¶ 21.) are either *Pelts* or *Sheep-skins*: If *Pelts*, they are chosen such as have a strong Grain, and the Grease well Wrought out of them: They are either Wet or Dry before they come to the *Press-mans* use: If Wet, he having before-hand provided a round Board, of about Nine inches and an half Diameter: Supposing the *Ball-stocks* to be six Inches diameter, lays the Round Board upon the whole *Pelt*, and cuts by the out-side of the Board so many round pieces as he can out of the *Pelt*, reserving two for his present Use.

And hanging the rest up (commonly upon the
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Braces of the Press) to dry, that they may not Stink or Mould before he have occasion to use them.

But if his *Pelts* are Dry, he lays them to Soak (by choice in Chamber-ly) but I never heard, or by my experience could find why it is preferred before Fair Water : For the purpose of Soaking them is only to supple them.

If he Work with Leather, It is chosen with a Strong and close grain : Wherefore by experience it is found that the Neck-piece, and indeed all along the back of the Skin is best ; but is commonly subject to be greasie, which gives the *Press-man* sometimes a great deal of trouble, to make his *Balls Take*. He also lays the *Ball Leathers* in Soak to supple them.

When they (either *Pelts* or *Leathers*) are well Soaked, he Rubs them well with both his Hands, and then twists and wrings them (as Women do Cloaths) to get the Water out again.

When they are well wrung, he Sits down upon a Seat about fourteen or fifteen Inches high, commonly a *Heap of White Paper*, if it stand conveniently for him ; but not upon a *Printed Heap*, least his Weight pressing it cause the un-dryed *Luck* to Set-off : He sits down, I say, and lays the *Ball-stock* upon his a little opened Thighs near his Knees, that with closing his Thighs he may hold it in a Steddy position, and with the Handle of the *Bull-stock* towards his Belly. Then taking the *Ball-Leather*, he laps or Folds about three quarters of an Inch of one part of it over so much of it towards his Left Hand into a Plaight, and laying the edges of that Plaight towards him, an Inch above the edge of the *Ball-stock*, he with the Head of the

the *Sheeps-foot* drives a *Ball-nail* into the middle of the *Plaight*, a little more than half an Inch above the edge of the *Ball-stock* : But he Drives the *Ball-nail* not quite up to the Head, but leaves about almost a quarter of an Inch of the Nail out ; that with the *Claw* of the *Seeeps-foot* he may Draw the Nail again when occasion serves.

Having driven the first Nail, he turns about the *Ball-stock*, till the opposite side, and as near as he can guess, point of the edge of the *Ball-stock* lyes directly upwards between his Thighs, (as before,) and then taking as near as he can guess the opposite edge of the *Ball-leather* between his Fore-fingers and Thumb of his Left Hand, he holds the edge of the *Ball-leather* upright, and having his Wooll or Hair Teized, lying by him on his right Hand on the Floor, he grasps at once as near as he can guess, so much as may just serve to fill his *Ball-leather* and the hollow of the *Ball-stock* ; which bringing to the hollow of the *Ball-stock*, he draws the *Ball-leather* over it ; and lapping the edges of the *Ball-leather* over, as before, makes another *Plaight*, and Drives another Nail, as before : So that here is now the two opposite Sides of the *Leather* Nailed on. Then he takes up the *Ball* by the Handle in his Left Hand, and observes whether the Wooll tend more to one than the other open half: If it do, he thrusts it with the ends of his Fingers of his Right Hand into the middle, or else over to the other Half, till the Wooll lyes equally on both the Halfs.

If he have put too much or too little Wooll into the *Ball*, he either takes some out, or adds more to, as the

the respective Half may require. Then lays it down again between his Thighs, as before, and lays another Plaight in the middle of the *Ball-leather* on one of the open Halves, and as near as he can guess, between the middle of the two opposite Nails; and Nails that Plaight down to the *Ball-stock*, as before.

In the like manner he Nails down the other open sides, (now Quarters,) and then again takes a View how the Wooll is disposed into the middle of the *Ball*; and where he finds it tend most to any of the open Quarters, he Drives the Wooll with the ends of his fingers, as before, or sometimes when the *Balls* have been Wrought with, and blackt with *Inck*, with the *Head* of the *Sheeps-foot* into the middle, and then Nails down as before all the open Quarters as near as he can guess; between the middle of his former driven Nails, and then again, takes another View as before, to see how the whole *Ball* pleases him.

If he finds any of the Plaights laid too near one another, he draws that Nail, and alters that Plaight, to lay it as near as he can by guess, in the middle between the next two Plaights.

Then he considers if his *Ball* be round: If it be not, he thrusts the Wooll from the bunching-out side, towards the wanting side, either with the ends of his Fingers, or the *Balls* of one of his Hands; while the Wooll is yet loose in the *Ball-stock*: For when the *Ball* has been Wrought withal, it will grow so hard, that the Wooll will not move out of its place.

Having *Knockt up* one *Ball* well, he *Knocks up* the other, as the first.

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The *Balls* are well *Knockt up*, when the *Wooll* is equally dispersed about all the *Sides*, and the middle smoothly covered with the *Leather*, viz. not rising in *Hillocks*, or falling into *Dales*, nor having too much *Wooll* in them, for that will subject them to soon hardning, and quickly be uneasy for the *Press-man* to Work with; or too little, for that will make the *Leathers*, as the *Wooll* settles with Working soon flap, and wrap over it self into *Wrinkles*. So that he cannot so well distribute his *Balls*: But the *Balls* ought to be indifferently plump, to feel like an *Hard-stuff Bed-pillow*, or a *Strong Spunge* a little moistned with *Water*.

Having *Knockt up* the *Balls*, and Rub'd out the *Ink*, as shall be shewed in the next ¶, he trys if his *Balls* will *Take*, that is, he Dabs the top of one of them three or four times lightly upon the hither part of the *Ink-block*: If he finds the *Ink* sticks to it equally all about, and that so much as has toucht the *Ink-block* is *Black*, it *Takes*: But if scarce any of the *Leather* is *Black*, or that it be *Black* and *White* in *Splotches*, then the *Balls* does not *Take*: Wherefore he considers whether his *Ball* be too *Wet*, or else *Greasy*, for each of these inconveniences will hinder the *Taking* of the *Ball*.

If it be too *Wet*, he burns half a *Sheet* or an whole *Sheet* of *Waste Paper*, and waves his *Ball* to and fro over the flame of it; but so quick and cautiously that he neither shrinks the *Leather* or Dryes it too much: In *Winter* time when a fire is at *Hand*, he dryes it gently by the fire.

If it be *Greasy*, he with the edge of the *Ball-knife* scrapes

scrapes off the thick Oyl, that Works down out of the *Nut* and *Spindle* of the *Press*, or else with the point of his *Knife* takes a convenient quantity of Oyl out of the *Plattin-pan*, or for want of either takes fresh Sallad Oyl and smears and spreads it well all over the whole *Ball-leather*; and then holding the *Ball-knife* in his Right Hand, with its edge a little sloping downwards that it cut not the *Ball-leather*, and the handle of the *Ball-Stock* in his Left Hand, he joyns the bottom of the *Ball-leather*, viz. as near the outer edge of the *Leather* as he can, for the *Ball Nails* to the edge of the *Ball-knife*, and turning the *Ball* about by its Handle, presses it hard against the sloapt edge of the *Ball-knife*, and at once drives the laid on Oyl and Grease too before the sloapt edge of the *Ball-knife*; but he keeps the Handle of the *Ball-Stock*, and consequently the whole *Ball* too, constantly turning, that the whole circumference of the *Ball* may be *Scraped*: And as the *Ball* has performed a Revolution against the sloapt edge of the *Ball-knife*, he draws gradually his Left Hand a little backish, that the sloapt edge of the *Ball-knife* may by several Spiral revolutions of the *Ball*, scrape up to the very top of the *Ball*, and carries before it the Oyl and Grease thither: Which having there, he gathers up upon the *Blade* of his *Ball-knife* and disposes of it, as of so much Dirt and Filth.

After a due process of either of these Operations respectively, his *Ball* will *Take*, and he again dabs gently the top of his *Ball* three or four times on the *Inck-block* (as before) and finding it *Take*, he takes the Handle of it into the clutched Fingers of his Left

Hand, holding the *Ball-stock* just a little above the circle of his Fore-finger and Thumb, and grasps the Handle of the other *Ball-stock* into his Right Hand, with the circle of his Finger and Thumb upwards, and the now bottom of his Right Hand downwards, but not resting upon the *Ball-stock*; and trys if that *Ball* will *Take*, by dabbing the Leather of it three or four times upon the other *Ball*: If it do not *Take* with dabbing, he twists the *Balls* in either Hand close and hard, contrary to one another, to besmear the upper with the under *Ball*. If after this, the upper *Ball* do not *Take*, he considers the cause, and remedies it, as he did the first *Ball*.

¶ II. Of Rubbing out Inck.

Before the *Press-man* goes to Work, he Rubs out his *Inck*.

If the *Inck* have lain long on the *Inck-block* since it was *Rubbed out*, the Superficies of it generally is dried and hardened into a Film or Skin, wherefore the *Press-man* carefully takes this Film quite off with the *Slide* before he disturb the Body of the *Inck*: For should any, though never so little of it, mingle into the *Inck*, when the *Ball* happens to take up that little particle of Film, and delivers it again upon the Face of the *Letter*, it will be a *Pick*, and Print black, and deface the Work: And if it get between the Face of two or more *Letters*, or the *Hollows* of them, it will obliterate all it covers. And if it be *Pulld* upon, and the *Press-man* not careful

careful to over-look his Work, it may run through the whole *Heap*.

Wherefore having carefully skinned off the Film with the edge of the *Slice*, he scrapes his *Slice* clean with the *Ball-knife*, lest some small parts of the Film should yet stick to, or remain on the *Slice*: And then with the *Slice* brings the body of *Inck* into the middle of the Plain of the *Inck-block*, and searches the sides of the *Inck-block*, by thrusting the edge of the *Slice* forwards along them and all the angles of the *Inck-block*, and so scrapes off all the *Inck* as clean as he can, and gathers it to the whole mass of *Inck*: Then with the *Slice* he turns the whole mass about half a score times over and over to mingle it well together, lest some part of it should be more consolidated than the rest: And to mingle it yet better, he then falls to *Rubbing* it with the *Brayer*, grasping the Handle of it in his Right Hand, he begins to *Rub* with all his strength at the hithermost side-boundings of the Body of *Inck*, and keeping *Rubbing* through the almost whole length of the *Inck-block*, he gradually proceeds to the farther side of the Body of *Inck*. In this manner of *Rubbing* he bears hardest upon the farther edge of the *Brayer*, because the hither sides of the *Inck-block* are not fenced in with Rails about them; and should he *Rub* with the bottom of the *Brayer* flat upon the *Inck-block*, he might draw too great a body of *Inck* to the unfenced sides; so that the *Inck* would be subject to run off. This *Rubbing* is only to spread the *Inck* pretty equally over the superficies of the *Inck-block*: Wherefore he now begins a circular *Rubbing*, observing in the cir-

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culation of the *Brayer* that he always a little mounts the part of the edge of the bottom, which in its progress is ready to approach a prominent body of *Inck*, that it may somewhat slide over it, that the *Inck* be not lickt up high on the sides of the *Brayer*.

Then with the Handle of the *Slice* in his Left Hand and the Handle of the *Brayer* in his Right, he joyns the bottom edge of the *Slice* to the side of the *Brayer*, holding the flat of the *Slice* Horizontal, and the bottom of the *Brayer* perpendicular both over the *Inck-block*, and keeping his *Brayer* and *Slice* in this position, by turning the Handle of the *Brayer* in his Right Hand, held pretty stiff against the edge of the *Slice*, he scrapes off all the *Inck* that the side of the *Brayer* has lickt up: And setting down his *Brayer*, he takes the *Slice* in his Right Hand and lays what *Inck* he scrapes off the side of the *Brayer* again upon the *Inck-Block*, and *Slices* the whole mass of *Inck* into the furthest corner of the *Inck-block*.

This *Rubbing* of the *Inck* may serve when the *Inck-block* had *Inck* on it before.

But if no *Inck* were on the *Inck-block* before, then he lays new *Inck* on the *Inck-block*: Wherefore he considers what Work he Works on: whether it be small or great *Letter*: If it be small *Letter*, or curious Work, the *Inck* must be *Strong* he Works with: But if it be great *Letter* or sleight Work, he makes *Soft Inck* serve, or at least mingles but a little *Hard Inck* with it.

If the *Inck* be too *Hard*, as sometimes in very frosty Weather it will be, then, though his Work be curious, yet he must *Rub* in a little *Soft Inck* to soften it; because

because it will not else *Distribute* well upon the *Balls*; especially if the *Leathers* be a little too Wet, or a little Greasie: Besides, it may and many times does pull and tear the Grain off the Skin; which not only spoils the Skin, but fills the *Farm* full of *Picks*.

Sometimes when he finds the *Inck* too pale, he *Rubs* in *Blacking*, but he first joults the bottom of the *Blacking Tub* three or four times against the ground, that if by chance any dirt or filth have gotten into it, it may sink to the bottom of the *Tub*.

But when he either mingles *Strong* and *Weak Inck* together, or else puts in *Blacking*, he applies himself again first to *Rubbing* with the *Brayer*, the length-way of the *Inck-block*, as before, and then to a circular *Rubbing*, as before; and to cleansing his *Brayer*, as before; and this long-ways *Rubbing*, circular *Rubbing*, and cleansing his *Brayer*, he reiterates so oft, till he judge the whole mass of *Inck* sufficiently *Rubbed* and mingled, and the *Blacking* perfectly imbibed by the *Inck*: And then he *Slices* the whole mass of *Inck* to the farthest corner of the *Inck-block*, as before.

¶ 12. Of Distributing the Balls.

I shewed you in ¶ 10. of this § how he dabb'd the *Ball* on the *Inck-block*, to try if it would *Take*: And I shewed you in what Posture he handled the *Balls* when he try'd if the other *Ball* would *Take*: Therefore for *Taking Inck* and Handling the *Balls* I (to avoid tautology) refer you to that ¶.

Having now *Taken Inck*, and gotten the *Balls* in his Hands, in that posture, he Works them side-ways upon

upon one another to and from him, and with a craft (acquired by use) in the Handling of the *Balls*, all the while keeps the *Handles*, and consequently the whole *Ball-stocks* (both) turning round in his Hands and in a motion contrary to each other, *viz.* His under *Ball* moving from the Left Hand to the Right, and his upper *Ball* moving from his Right Hand to the Left; and by and by in a second motion contrary to the first, *viz.* his under *Ball* moving from the Right Hand to the Left, and his upper *Ball* moving from the Left Hand to the Right.

And these motions and Operations he continues so long till he judges, and in part perceives the *Jack* is equally *Distributed* all over the whole *Ball-Leathers*.

The first way of turning the *Ball Handles*, while the *Balls* are moved to and from him, is made by pressing the ends or *Balls* of the fingers of both his Hands upon the *Ball-handles* from-wards his Hands. And the second way of turning them contrary to the first, is made by gathering in the ends or *Balls* of of his fingers while they are in their circular to and fro motion. But because in gathering in his fingers, he does somewhat dis-engage his grasp of the *Ball-Handles*, therefore he lightly and almost insensibly, tosses the *Ball-stocks* a little up, that when they are dis-engaged from a close grasp, his fingers ends may the easier draw the *Handles* towards him. This is a Hand-craft, which by continued use and practice, becomes familiar to his Hands.

¶ 13. Of Beating.

The *Press-man* imagines, or by his eye judges the length of his *Form* (be it what *Volumne* it will) devided into four equal parts or *Rows*, which four *Rows* for distinction sake, I shall number from the Left Hand to the right, with first Row, second Row, third Row, fourth Row, just as an *Octavo Form* is exactly devided by four *Rows* of *Pages*.

He places his Left Hand *Ball* at the hither end of the first Row, so that though the *Ball* be round, yet the square encompassed within that round shall sufficiently cover so much of the square of the hither end of that Row as it is well capable to cover ; and his Right Hand *Ball* he sets upon the hither end of the third Row : He sets his *Balls* close upon the *Face* of the *Letter*, with the *Handles* of the *Ball-stocks* a little bending towards him : But as he presses them upon the *Face* of the *Letter*, he mounts them perpendicular ; and lifting at once both the *Balls* lightly just clear off the *Face* of the *Letter*, he removes them about the fifth part of the breadth of the *Form* upwards, viz. towards the farther side of the *Form*, and again sets them close down upon the *Face* of the *Letter*, with the *Handles* of the *Ball-stocks* again bending a little towards him, as before : and as he presses them upon the *Face* of the *Letter*, mounts them perpendicular, as before : Thus in about four or five or six such motions, or rather removes of the *Balls*, according to the breadth of the *Form*, he *Beats* over the first and third Rows. Thus *Beating* from the hi-

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ther towards the farther side, is in *Press-mens* phrase called *Going up the Form*.

The reason why he bends the *Handles* of the *Ball-stocks* a little towards him, is, that the *Ball-leathers* drag not upon the *Face* of the *Letter*; for then the edges of the hollows between the *Lines* or *Words*, or the edges of the cavities below the *Face* would scrape *lick* off the *Balls* to stop up or choak the *Form*. And the reason why (before he removes them) he mounts the *Handles* of the *Ball-stocks* a little perpendicular, is, that the *Balls* may touch in their greatest capacity upon the *Face* of the *Letter*.

To *Come down the Form*, he skips his *Balls* both at once from the first and third Row to the second and fourth Row, and brings them down as he carried them up; only, as before, he bended the *Handles* of the *Ball-stocks* a little towards him, so now he bends them a little from him: That the *Ball-leathers* (now *Coming down*) drag not, as aforesaid. Then in like manner he again skips the *Balls* from the second and fourth Row to the first and third Row, and again *Goes up the Form* with the *Balls*, as he did before. And then again skips, as before, and *Comes down the Form* again with the *Balls*.

Having thus gone twice upwards and twice downwards with the *Balls*, the *Form* is sufficiently *Beaten* in a train of Work, when the *Face* of the *Letter* Takes well.

But if he *Beats* the first Sheet of a fresh *Form*, or after a *Form* is *Washed*, or he makes a *Proof*, he *Goes* three four or five times *Upwards* and *Downwards*: Least the *Face* of the *Letter* should happen to be Wet
or

or moist, and consequently un-apt to take *Inck*, without reiterated *Beatings*.

¶ 15. Of Pulling.

We will suppose now two *Press-men* going in the Morning to their train of Work: The one they distinguish by the name of *First*, the other his *Second*, these call one another *Companions*: The *First* is he that has wrought longest at that *Press*, except an Apprentice, for he must allow any Journey-man though new-come that stile: Generally the Master Printer reposes the greatest trust upon his care and curiosity for good Work; although both are equally liable to perform it.

All the privilege that the *First* has above the *Second* is, that the *First* takes his choice to *Pull* or *Beat* the agreed stint first: And that the *Second* *Knocks up the Balls*, *Washes the Forms*, *Teizes Wooll*, and does the other more servile Work, while the *First* is imploid about making *Register*, ordering the *Tympan*, *Frisket*, and *Points*, &c. or otherwise *Making Ready the Form*, &c.

The *First* now takes his spell at *Pulling*: For the *First* and *Second* take their spell of *Pulling* and *Beating* an agreed number of *Tokens*: Sometimes they agree to change every three *Tokens*, which is three Hours work, and sometimes every six *Tokens*; that they may both *Pull* and *Beat* a like number of *Tokens* in one day.

Under the general notion of *Pulling* and *Beating* is comprised all the operations that is in a train of work

performed by the *Puller* and the *Beater* : For though the *Puller Lays on Sheets*, Lays down the *Frisket*, Lays down the *Tympans* and *Frisket*, Runs in the *Carriage*, Runs out the *Carriage*, takes up the *Tympans*, Takes up the *Frisket*, Picks the *Form*, Takes off the *Sheet*, and Lays it on the *Heap*, yet all these Operations are in the general mingled and lost in the name of *Pulling*. And as in *Pulling*, so in *Beating* ; for though the *Beater Rubs* out his *Inck*, Slices it up, Distribute the *Balls*, peruses the *Heap*, &c. yet all these Operations are lost in the general name of *Beating*. Thus they say the *First* or the *Second* is *Pulling* ; or, the *First* or the *Second* is *Beating* ; though they are performing the different Operations aforesaid : unless upon particular occasions the respective Operations, are particularly nam'd.

As there are many Operations conjunct to *Pulling*, and *Beating*, so the *Press-man* performs them with various Set and Formal Postures and Gestures of the Body. For,

To take a Sheet off the *Heap*, He places his Body almost straight before the hither side of the *Tympan* : I say almost straight, Because it is more straight before the side of the *Tympan* than it is before the angle made by the *Paper-bench* and the side of the *Tympan*. But he nimbly twists the upper part of his Body a little backwards towards the *Heap*, the better to see he takes but one Sheet off, which he loosens from the rest of the *Heap* (as I have shewed before) by drawing the back-side of the Nail of his right Thumb on his Right Hand nimbly over almost the whole length of the *Heap*, and receiving the hither end of the Sheet with

with the inside of his Left Hand fingers and Thumb catches with his Right Hand about two inches within the farther edge of the Sheet near the upper corner, and about the length of his Thumb below the hither edge of the Sheet, and brings it nimbly to the *Tympan* : And at the same time twists his Body again straight before the *Tympan*, only a very little moving his right Foot from its first Station a little forwards under the *Carriage Plank* : And as the Sheet is coming to the *Tympan* (we suppose now he Works upon *White Paper*) he nimbly disposes the fingers of his Right Hand under the farther edge of the Sheet near the upper corner ; and having the Sheet thus in both his Hands, lays the farther side and two extream corners of the Sheet down even upon the farther side and extream farther corners of the *Tympan-sheet*, but he is careful the upper corner of the Sheet be first laid even, upon the upper corner of the *Tympan-sheet* ; that he may the sooner disengage his Right Hand : And if by the nimble casting his eye, he perceive the sides of the Sheet lye un-even upon the *Tympan-sheet*, he with his Left Hand at the bottom corner of the Sheet, either draws it backwards, or pulls it forwards, as the Sheet may lye higher or lower on the hither corners of the *Tympan-sheet*, while his Right Hand being disengaged, as aforesaid, is removed to the backside the *Ear* of the *Frisket*, and with it gives it a light touch to double it down upon the *Tympan*. And by this time his Left Hand is also disengaged, and slipt to the hither under corner of the *Frisket*, to receive it, that it fall neither too hard or too quick down upon the *Tympan* : For hard

falling may shake the loose Sheet on the *Tympan* out of its place; and so may the quick pressure of the Air between the *Tympan* and *Frisket*, after the Sheet is well laid: and while his Left Hand receives the *Frisket* his right is disengaged from the *Ear* of the *Frisket*, and removed to the middle of the back-side the *Tympan*; which he grasps between the Balls of his Fingers and Thumb, to lift it off the *Gallows*, and double it and the *Frisket* together on the *Form*. And while the *Tympan* is coming, he slips his Left Hand Fingers from under the *Frisket* to the hither outer corner of it, as well to keep the Sheet close to the *Tympan* in its position, as to avoid the jobbing of the lower side of the *Frisket* against any small square shoulder, either of the *Furniture*, *Quoins*, *Chase*, or the corners that may stand higher than their common Plain.

Then nimbly slipping his Left Hand, he with it grasps the *Rounce*, and with a moderate strength, nimbly gives its *Winch* about one Turn round; I say about, because the first *Pull* will generally fall out to be made about the middle of the *Carriage*; as was shewed in § 11. ¶ 16.) but perhaps not just in the middle: yet to regulate his *Runing in*, he made a mark before on the farther Rail of the *Tympan*, (as I shewed in ¶ 3. of this §) to which mark he *Runs* the *Carriage in*, till he bring the mark in a Range with the fore-edge of the *Plattin*; and as it is coming, skips his Hand to within an Inch or two of the end of the *Bar*, and then at once gently leans his Body back, that his Arm as he *Pulls* the *Bar* towards him may keep a straight posture; because in a *Pull* it has then
the

the greatest strength. And he also slips his right Foot upon the *Foot-step*, while his Left Hand holds fast by the *Rounce*; as well to rest on the *Foot-step* and *Rounce*, as to enable his Body to make a stronger *Pull*; which will prove *Longer* or *Shorter*, according to the strength put to it, and also the *Hard* or *Soft Justifying* of the *Head*, (as was shewed in ¶ 5. of this §.)

Then disengaging his Right Hand again from the *Handle* of the *Bar*, he slips it to the *Bow* of the *Bar*, before the *Handle* fly quite back to the *Cheek* of the *Press*: For should the *Bar* by its forcible Spring knock hard against the *Cheek* of the *Press*, it might not only shake some of its Parts or circumstantial appurtenances out of order, but subject the whole Machine with oft reiteration to an unstable position. Besides, the farther the *Bar* flies back, the more he hinders quick riddance in recovering it again. But yet he must let the *Bar* fly so far back as that the *Tympan* may just rise clear off the *Plattin*; lest when he *Runs* in his *Second Pull*, the *Face* of the *Plattin* rub upon the *Tympan*, and shoves the *Sheet* upon the *Face* of the *Letter*, and sometimes *Slurs*, and sometimes *Doubles* it upon the *Face* of the *Letter*.

Having *Pull'd* the *First Pull*, and having the *Rounce* still in his Left Hand, He turns the *Rounce* about again, till the *Carriage Runs* in so far, as that the second mark on the Rail of the *Tympan* comes into a Range with the hither edge of the *Plattin*, as before the first mark did; and then *Pulls* his second *Pull*, as he did his first; and slips his Right Hand again off the *Handle* of the *Bar* to the *Bow*, (as before) and guides the *Bar* up to its *Catch* leisurely, that coming
now.

now near the *Cheek* it knock not against it: and just as he has *Pulled* his *Second Pull*, he gives a pretty quick and strong pressure upon the *Rounce*, to turn it back, and the *Carriage* out again: And so soon as he has given that one pressure, (as aforesaid) he disengages his Left Hand from the *Rounce*, and claps the fingers of it under the middle of the *Tympan*, and on the *Ear* of the *Frisket*: and while this is doing, removes his Right Hand to the now upper, but immediately it will be the under-side of the *Tympan Rail*, within four or five Inches of the upper end of it, to receive the *Tympan*, as it is lifted up off the *Form* by his Left Hand. And having thus received it, lets it descend gently down on the *Gallows*. And as it is descending, slips his Left Hand fingers under the hither lower corner of the *Frisket*, and gives the *Frisket* a toss up; while by this time his Right Hand being disengaged from the *Tympan*, is ready to catch the *Frisket* by the *Ear*, and convey it quick and gently to its *Stay*: And while the *Frisket* is going up; he slips the end of the middle finger of his Left Hand, or sometimes the ends of his two middle fingers with their Balls upwards, under the hither lower corner of the *Pulled off Sheet*, and at the instant he has got them under, he nimbly bows his Joynts upwards, to throw up the corner of the Sheet, to make it mount a little, for him to gather about two Inches hold of it between the Balls of his Thumb and fore-finger. And heaving the whole Sheet by this corner a little upwards, He at the same time lifts it off the *Points*, and draws it somewhat towards him; and as it comes, catches it near the upper corner of the same side of the Sheet,

Sheet, between the foremost Joynts of his fore-fingers and Ball of the Thumb of his Right Hand, and nimbly twisting about his Body towards the *Paper-bench* carries the Sheet over the *Heap* of *White-paper* to a *Paper-board*, which before he placed beyond that *Heap* on his Right Hand, (as aforesaid in ¶ 14.) and lays it down upon a Waste-sheet laid for that purpose on that *Paper-board*; but while it is coming over the *White-paper Heap*, though he have the Sheet between both his fore-fingers and Thumbs, yet he holds the Sheet so loosely that it may move between them as on two Centers, as his Body twists about (as aforesaid) from the side of the *Tympan* towards the side of the *Paper-bench*.

Thus you see both the *Press-mans* Hands at the same time alternatively ingaged in different Operations: For while his Right Hand is employed in one Action his left is busie about another, and these exercises so suddenly varied, that they seem to slide into one another one Posture; beginning when the former is but half performed.

Having thus *Pulled* one Sheet, and laid it down: He turns his Body towards the *Tympan* again, and as he is turning gives the next Sheet on the *White-paper Heap* a Touch with the backside of the Nail of his Right Thumb, as before, to draw it a little over the hither edge of the *Heap*, and lays it on the *Tympan*, &c. as he did the first; and so successively every Sheet till the whole *Heap* of *White-paper* be *Wrought off*.

As he comes to a *Token-sheet*, he un-doubles that, and smooths out the Crease with the back-side of

the Nails of his Right Hand, that the *Face* of the *Letter* may Print upon smooth Paper. And being Printed off, he folds it again, as before, for a *Token-sheet* when he works the *Reiteration*.

Having *Wrought off* the *White-paper*, he turns the *Heap* thus:

He takes the *Paper-board* that his *White-paper* lay on, and sets it down on the ground: Then removes the *Heap* to his Left Hand; then takes up the *Paper-board*, and lays it on his Right Hand: And if it be *Twelves*, or any *Form Imposed* like *Twelves*, as *Twenty fours*, &c. he turns it from one long side of the Paper to the other, that is, the long side of the Paper that stands on his Right Hand when the Printed side lies upwards, he turns over to his Left Hand, and lays the un-printed side upwards. In performing this, he grasps off of the *Wrought off Heap* so much at once between both his Hands as he can well govern, without disordering the eveness of the sides of the *Heap*, viz. a *Token*, or more, and lays that upon the *Paper-board*; then takes another grasp in like manner, and lays that on the first grasp, and so successively, till he have turned the whole *Heap*, grasp by grasp. Then removes the *Heap* near the *Tympan*, and lays the other *Paper-board* beyond it, as the first *Paper-board* stood before; always remembering to lay a *Waste-sheet* first on the *Paper-board*.

Having now turned the *Heap*, and made *Register* on the *Reiteration Form* (as was shewed in ¶ 7. of this §) he Works off the *Reiteration*: But he somewhat varies his posture in the *Laying on his Sheets*: For as before, when he wrought *White Paper*, he
catcht.

catcht the Sheet by the upper farther corner with his Right Hand, he now having heaved up the Sheet (as aforesaid) catches it as near the farther side of the farther *Point-hole* as he can, with the Ball of his Right Hand Thumb above the Sheet, and the Ball of his fore-finger under the Sheet, the readier to lay the *Point-hole* over its respective *Point* : which having done, he slips his Body a little backwards, and both his Hands with it, his Right Hand towards the hither *Point-hole*, with the back-sides of the Nails of his fingers to draw or stroak it over the *Point* : and the fingers of his Left Hand, as they come from the farther corner, nimbly slipping along the bottom edge of the Sheet, till they come to the hither corner; and then with his fore-finger and Thumb, layes hold of it, to help guide the *Point-hole* on that *Point* also : Then Pulls that Sheet, as before, as he did the *White Paper*, and so successively all the rest of the *Reiteration*. Only, the *Token-sheets*, as he meets with them, he Folds not down again, as he did the *White Paper*.

If a *Press-man* have no *Companion*, but works alone; he has a little oblong *Square Form* or Bench made to stand so high as the *Face* of the *Letter* upon the *Press-stone*, and so long as to contain the *Balls* when set upon the *Ball-leathers*.

This *Form* or Bench some Work-men will place on the hither side the hither *Cheek*, within about half an Inch of the foreside of the *Cheek* : And other Work-men will place it on the farther side of the *Carriage*; each sort of Work-men supposing that in the place he sets it, the *Balls* stand most commodious for

his quick taking up and setting down : I shall not plead the convenience of either, but in short speak to the inconveniences of both.

The inconvenience of placing it on the hither side the hither *Cheek*, is, that the *Press-man* must twist his Body somewhat about to take up the *Balls*. And the inconvenience of placing it on the further side the *Carriage*, is, that the *Press-man* must thrust his Body over the *Form* to take up the *Balls*: both ways strain the Body, and hinder riddance.

Those that place it on the hither side the *Cheek*, begin and end their *Beating* as has already been shewed, viz. on the hither side the *Form* : But those that place it on the farther side the *Carriage*, begin and end their *Beating* on the Rows on the farther side the *Form*.

One *Press-man* in his train of Work will *Beat* so soon as he has laid the *Tympan* on the *Gallows* after *Pulling* : Another will not *Beat* till he has laid his Sheet on the *Tympan*, and doubled the *Frisket* down on it: both sorts fancying their own way most quick and commodious : For these conveniences are the purposes they both drive at.

¶ 16. Of Printing Red, or other Colours with Black.

When *Red* and *Black* are to be Printed upon the same Sheet, the *Press-man* first *Makes Register*, as was shewed ¶ 7. and *Makes Ready* his *Form* as was shewed ¶ 14. of this §. Then having a new *Frisket Drawn*, as was shewed ¶ 8. He Prints upon his new *Frisket* with *Black*. And having before a *Proof-sheet*
Printed

Printed *Black*, with the Words to be Printed *Red* under-lined on that *Proof-sheet*; He takes off his *Frisket*, and lays it flat on a *Paper-board*, and with a sharp-pointed Pen-knife neatly cuts out those words on the *Frisket*, and about half a Scaboard *Margin* round about the words, that he finds under-lined on the *Proof-sheet*: Then sets the *Frisket* by till he has wrought off his *Heap* with *Black*, and puts his common *Frisket* on the *Joynts* of the *Tympan* again.

While the *Press-man* is *Cutting* the *Frisket*, the *Compositer* takes those *Words* out of the *Form* that are *Under-lin'd* on the *Proof-sheet*, and in their place puts *Quadrats*, m-*Quadrats*, *Spaces*, &c. to *Justifie* the *Lines* up again.

Then *Locking up* the *Form*, the *Press-man* Works off the *Heap* *Black*, as was shewed in the last ¶.

Having wrought off his *Heap* *Black*, he takes off the common *Frisket*, and puts on his new cut *Frisket*: Then taking a piece of thick Scaboard he cuts it into so many small slips as there are *Whites* in the *Form* to be Printed with *Red*; These small slips he cuts exactly to the length of the *Quadrats*, &c. the *Compositer* put in, and to the breadth of the *Body*; but rather a small matter less than bigger, lest they bind at the bottom of the *Shank* of the *Letter*: for when the *Compositer* takes out the *Quadrats*, &c. he put in before the *Form* was *Wrought off* *Black*, these slips of Scaboards the *Press-man* pricks on the Point of a *Bodkin* and puts them into their respective holes: And being loosen'd off the Point of the *Bodkin* with the blunt Point of another *Bodkin*, are laid down flat on the *Press-stone*; These slips are called *Underlays*, and

are described in ¶ 14. of this §. Upon these *Underlays* the *Compositer* puts in again the *Words* or *Letters* he took out before the *Form* was *Wrought off Black*: So that these *Words* now stand higher than the other *Matter* of the *Form*, and therefore will Print when the other *Matter* will not. But yet for the more assurance that the other *Matter* Print not, the *New-cut Frisket* was prepar'd, which hinders any thing to Print but what Prints through the Holes cut in it; which Holes these *Underlaid Words* fall exactly through.

Having mingled the Red, or any other intended Colour with *Varnish*, as shall be shew'd in the next ¶, he *Beats* the *Form* as with *Black*; and *Pulls* it very lightly, lest these *Underlaid Words* standing higher than the rest of the *Matter*, Print too *Hard*.

¶ 17. Of mixing and Grinding Colours with Varnish.

Varnish is the common *Menstruum* for all Colours that are to be used in Printing.

Red is the chief Colour that is used with *Black* in Book-Printing: of *Reds* there are two sorts in general use, viz. *Vermillion* and *Red-Lead*; *Vermillion* is the deepest and purest Red, and always used to Books of Price. *Red-Lead* is much more faint and foul, and though more used than *Vermillion*, yet used only to Books of Vulgar Sale and Low price, as Almanacks, &c.

Yet may other Colours also be used to Print withal; yea, any Colours that are used in Oyl-Painting, as *Lake* and *Russet*, which are *Reds* deeper than
Ver-

Vermillion ; *Viriditur Indico* and *Bice* for *Blews* ; *Orpment*, *Pinck*, *Tellow Oaker*, for *Yellow* : *Viridigreace*, and *Green Viriditur*, for *Greens* : or what other *Colours* may be fancied.

But all *Colours* for *Printing* must be *Ground* with *Soft Varnish* ; especially those *Colours* that are of themselves *Dryers* ; as *Red-Lead*, *Vermillion*, *Orpment*, *Verdigrease* ; For should they be *Ground* with *Hard Varnish* the *Colour'd Inck* would *dry* and *harden* so quick and fast upon the *Form*, that it would soon be choaked up, and consequently want *Washing* e're the *Form* be *Wrought off* ; which would be very troublesome to the *Press-man*, because he must expect to have all his *Underlays* to new fit to their places : And besides, it will so *Dry* and *Harden* upon the *Balls*, that the *Grain* of the *Leathers* would quickly *tear off*, and fill the *Form* full of *Picks*.

The fittest *Colours* therefore for *Printing*, are such as are of the lightest *Body* and *Brightest Colour*.

They are to be *Ground* with a *Mullar* on a smooth *Marble Stone*, so long that the *Colour* becomes *impalpable*, and is throughly mingled with the *Varnish*.

¶ 18. *Of Printing with Gold and Silver.*

This *Operation* is seldom used but for *Printing Names* ; and therefore rarely dress'd in a *Form* to the *Press* ; but is usually *Printed* in the *Stick* : And then the *Compositer* *Justifies* his *Stick* very *Hard*, as well that

that the *Letters* fall not out when the *Back* of the *Stick* is turned upwards, as that the strength of the *Hard Varnish* the *Face* of the *Letter* is *Beat* with, pulls not the *Letter* out of the *Stick*.

Therefore the *Press-man* makes two little *Balls*, by tying about an Handful of Wooll in new clean Leather, and dabs one of his *Balls* upon the Hardest *Varnish* he has, and with the other distributes his *Varnish* to a convenient Fatness, as he did his *Balls* in ¶ 12. With one of these *Balls* he *Beats* the *Name*; and having his Paper *Wet*, he lays a single *Blanket* on the *Correcting-stone*, and his Paper on the *Blanket*; and with a *Riglet* fitted to the *Stick*, he presses the *Letter* to keep it straight in *Line*: Then places the *Face* of the *Letter* exactly flat down upon the Paper, and with the force of both his Hands presses the *Letter* hard and even down upon the Paper, to receive an Impression: But he takes care not to wriggle the *Letter* in the *Stick* backwards or forwards, lest either the *Beard Print*, or the sides of the *Letter* be more or less besmeared with the *Varnish*: Because the Gold or Silver will stick to the least Sully that the *Varnish* may chance to make.

Then cutting his Gold or Silver to a size full big enough to cover the Printed *Name* or *Matter*, he lays his Gold or Silver on what was Printed, and with a little White Cotton gently presses the Gold or Silver upon the Printed *Matter*, and lets the Paper lye by a while; as well that it may dry, as the *Varnish* Harden, (which will quickly be) he with his Handkerchief gently wipes over the Printed *Matter*. So shall all the Gold or Silver that was toucht

toucht by the *Varnish*, stick to the *Varnish* on the Paper, and the other will wipe away.

If he lists to Polish it, he uses a Tooth or the Ivory Handle of a Knife.

¶ 19. *Rules observed ; and Remedies to the Inconveniences the Press-man may meet with in a Train of Work.*

1. The *Press-man* is to make a *Proof* so oft as occasion requires : If he takes off his *Form* to make a *Proof*, he *Un-locks* and lays the *Quoins*, as shall be shewed when I come to *Washing* of the *Form*:but many *Printing-houses* have an empty *Press* stands by to make *Proves* on.

The *Compositer* having brought the *Form* to the *Press*, lays it down on the *Press-stone*, and the *Press-man* places it even under the *Plattin*, that the *Flat-tin Bear* not harder on the hither or farther side of the *Form* : Then he *Pulls* the *Cards* upon the *Form*, to press it into a flat position : Then *Beats* the *Form* four or five times over, that he may be sure it *Take* : Then he lays the *Proof-sheet* on the *Form*, so as by his Judgement it shall have an equal *Margin* on all its opposite sides, and a double *Blanket* on the *Proof-sheet* ; and *Running in the Carriage*, *Pulls* the *Proof-sheet* : Having *Pull'd* it, he *Runs-out* the *Carriage* again, and takes the *Proof-sheet* off the *Form*. Then with the *Ly-brush* dipt in *Ly*, he *Rubs* over the *Face* of the *Letter* three or four times, to Wash off what *Inck* may remain on it, and carries the *Form*
Y y again

again to the *Correcting-stone* and lays it down: And the *Proof* he carries to the *Compositers Case*.

2. If the *Form* he Works on be *Small-letter*, or *Old Letter*, he uses *Strong Inck*; and *Beats Lean*: For *Weak Inck* and *Fat Beating*, will quickly Choak up the *Face* of the *Letter*. But to fetch off *Hard Inck* thin *Beat* on the *Face* of the *Letter*, he *Pulls Hard*. But if the *Form* be great *Letter* or *Black English Letter*, it will allow *Fatter Beating*.

3. He keeps a constant and methodical posture and gesture in every action of *Pulling* and *Beating*, which in a train of Work becomes habitual to him, and eases his Body, by not running into unnecessary diversions of Postures or Gestures in his Labour, and it eases his mind from much of its care, for the same causes have constantly the same effects. And a *Pull* of the same strength upon the same *Form*, with the same *Beating*, and with the same *Blankets*, &c. will give the same Colour and Impression.

4. That every two Sheets, if the *Form* be small *Letter* (rarely three, unless *Great Letter*) he *Takes Inck*; and so soon as he comes off the *Form*, viz. has *Beat* it, he falls to *Distributing* his *Balls*. And that Sheet which he *Takes not Inck* he steps to the *Heap* to overlook the Colour, viz. whether he has *Taken* too much or too little *Inck*; and to see if no accidents have befallen the *Form*, viz. that no *Letters*, *Quadrats* or *Furniture*, &c. Rise, that no *Letters* are *Batter'd*; That *Bearers* fail not, viz. grow so thin with long *Pulling* on, as not to perform the office of *Bearers*; that the *Register* keep good; that no *Pick* be got into the *Form*, or any other accident that may deface

face the beauty of the Work, but all this while still keeps his *Balls Distributing*.

If he have taken too much *Inck*, which sometimes may happen (but seldom for want of carelessness) he will not *Take Inck* again, till he have wrought his *Balls* to a good and moderate Colour. But if the Sheet already *Pull'd* be so *Black* that it may not tolerably pass, he Doubles or Folds it in the middle and lays it cross the *Heap*, that the *Gatherer* may take or leave it, in case the *Heap* falls Short. If he foresee the next Sheet will also be too *Black*, he takes a Dry Sheet of Waste Paper between his *Balls* and *Distributes* upon that Dry Sheet, that it may take off the *Inck*.

If in doing this, the strength of the *Inck* have *Pull'd* the *Paper* to pieces, so that small rowl'd-up bits may stick upon the *Ball-leathers*, if they be but a few he picks them off with his Fore-finger and Thumb, but if there be many he makes his *Balls* clean by *Scraping* them (as I shewed in ¶ 10. of this §) for else these small rowl'd-up bits of Paper will be apt to fill the *Form* full of *Picks*.

If *Letters*, *Quadrats* or *Furniture Rise*, he puts them down, the *Letters* and *Quadrats* with his *Bodkin*, and the *Furniture* with his *Hammer*, and *Locks* the *Quarter* they are in, a little Harder.

If any *Letters* are *Batter'd*, he *Unlocks* the *Quarter* they are in, and desires the *Compositer* to put in others in their room.

If *Bearers Fail*, that is, Squeeze thinner with long *Pulling* on, he takes those *Bearers* off, if they are on the *Frisket*, and puts on thicker : But if the *Furni-*

ture, were *Under-laid* (as I shewed in ¶ 7. of this §) he *Unlocks* the *Quarter* they are in, and *Under-lays* them according to his Judgement.

If *Register* be *Out*, which sometimes happens by the starting of the *Quoins*, he mends it, as I shewed in ¶ 7. of this §.

If a few *Picks* are got into the *Form*, that is, little bits of Paper, Skin or Film of *Inck*, Grease or other filth which may stick to the *Face*, or get into the hollows of the *Letter*, he with the point of a Needle picks them out: But if many be gotten in, he takes off the *Form* and Washes it, as shall hereafter be shewed.

And though he every other Sheet overlook the *Heap* (as was said before) yet his *Companion* that *Pulls*, by an habitual use casts his eye upon every single Sheet; Yet rarely hinders his riddance by it, for while he is taking the Sheet off the *Tympan*, he gives a quick spreading glance upon it, and lays it down, as was shewed ¶ 15. of this §, unless he perceive somewhat to mend: For then he lets it lye on the *Tympan* till he has mended what was amiss.

And that he may *Take Inck* more equally, to keep the *Balls* of an equal Fatness, he keeps the *Rubb'd out Inck* on the *Inck-block* of an equal Fatness; which to do, he with the under-edge of the bottom of the *Brayer*, draws often from the mass of *Inck* a small, (and as near as he can guess) an equal quantity of *Inck*, viz. about the quantity of a Pea, and with the *Brayer* Rubs and disperses that *Inck* of an equal thickness, all over the hither corner of the *Inck-block*. While this is doing he holds the *Balls* upright on one another.

another in his Left Hand, leaning the Handle of the uppermost *Ball-stock* against his Breast.

The equal and often *Taking* of *Inck* in a small quantity, and constant *Distributing* of the *Balls*, is the onliest means to keep the *Heap* throughout of an equal Colour, and to avoid *Beating* of *Fryers*.

5. If he meets with naughty Sheets in his Work; as torn, or stain'd, &c. he Prints them not, but throws them under the *Paper-bench*; and if any crease or wrinkles be in any Sheet, he laying the backs of his four Left Hand fingers upon a smooth place in the Sheet, rubs with the backs of the Nails of his Right Hand Fingers from-wards him upon the wrinkles, till he have smoothened them.

6. And though his constant care is to Lay every particular Sheet even upon the *Heap*, yet it often happens either through *White Pages* that may come in the *Form*, which because not Printed lye solid on one another, the unequal pressing of one side or end of the Paper, or the unequal Bearing of the *Plattin* on one side or end of the *Form*; I say it often happens by these accidents, that the *Heap*, as it grows higher is on one part of the Sheet raised above, and on another part sunk below an Horizontal level: It is raised higher on that side or end of the *Heap* most prest in the *Tympan*, and by consequence makes the Paper there more *Huffie*; Because deep pressure of the *Letter* into the Paper below the common level of the Sheet bears the Paper off from the *Heap*, on the underside the Sheet; and the greater the number of Sheets are thus Printed off and laid on the *Heap*, the more that side or end of the *Heap* shall Rise.

Y y 3 And

And by the Rule of Contraries, when *White Pages* come in the *Form*, the greater number of Sheets laid on the *Heap*, shall where those *White Pages* lye, make the *Heap* lower in that place, because they clap solid together, for want of Printing the Paper through the backside level of each Sheet: So that the small un-level lying of every Sheet, though unperceptable, in a small number of Sheets, makes each Sheet incline to the lowest side of the *Heap*, and as the *Heap* accumulates height, throws the *Heap* more or less towards the dripping side, or end over the bottom of the *Heap*.

To remedy which, he claps the insides of both his Hands against both the ends of the *Heap*, but more forcibly against the Hanging over end towards the other end, till he has drove the *Heap* into an upright position.

If either of the sides hang over, he with the inside of his Left Hand commonly against the farther side of the *Heap*, and the outside of his Right Hand fingers on the hither side the *Heap*, either draws the hanging over side towards him with his Left Hand, or thrusts it from him with his Right Hand fingers, as aforesaid, while his opposite Hand does the office of a stop, that it be not drawn too forward, or thrust too much backward. Then where the *Heap* rises above the Level, he with the inside flats of one or both of his Hands presses it down into an Horizontal Plain.

7. If it be a *Reteration* he Works, and a great Number is laid on, he uses a *Tympan-cloth* instead of a *Tympan-sheet*: This *Tympan-cloth* is a Fine and even

even Linnen Cloath, about an Inch or two larger on every side than the Paper he Works on: He Wets this Cloath and wrings the Water out again, so that it remains only moist: Then lays his Cloath instead of his *Tympan-sheet*, and Pastes the corners of the under side of it to the *Tympan*, and Works upon it as on a *Tympan-sheet*.

One reason why he uses a Cloath to Work the *Reteration* on rather than a Sheet of Paper, is, because a Sheet of Paper quickly wears out, which a Cloath will not do. Another reason is, that when the *Inck* that wrought off the *White Paper* Sets off upon the *Tympan-Cloath*, it may in clean *Ly* be washt clean again: For a good *Press-man* will not Work on a foul *Tympan Cloath* or (if he use no Cloath) on a foul *Tympan-sheet*, because as the *Inck* of the *White-paper* aforesaid, set off on the *Tympan Cloath*, so the more the *Tympan Cloath* has gathered *Inck* from the *White-Paper*, the more it will Return or give back again, towards the besmearing of every Sheet that is Printed on it.

The reason why the *Press-man* does not use a Cloath to Work the *White Paper* with, is, because in Working the *White-Paper*, the use of the *Tympan-Sheet* is principally to lay all the Sheets of the *Heap* even by, as being of the exact size with all the rest of the *Heap*, which a *Tympan-Cloath* is not, nor could it, without great trouble, be reduced to that size by the *Press-man*, or if reduced to that size, without much difficulty be laid even or square on the *Tympan*: Because the *Cloath* when *Wet*, will be hard to be kept straight and square, but every side will

will naturally run into irregularities, which a Sheet of *White Paper* will not do.

8. Sometimes, through the loose *Hanging* of the *Plattin* on its *Cords*, or through the much wearing of the *Hose*, or the *Garter*, or the *Worms* in the *Nut* and *Spindle*, or the irregular wearing of the *Toe* of the *Spindle* in its *Nut*, or too much play of the *Tennants* of the *Head* in their *Mortesses*, or the irregular dryness of the *Tympan*, or through irregular *Running* in of the *Carriage*, It will happen that the *Letter* will *Double* upon the *Sheets*, that is, *Print double*.

If the loose *Hanging* of the *Plattin* be the cause, it is easily mended by turning about the *Female Screws* fitted to the tops of the *Hose*, as was shewed ¶ 4. of this §.

If the *Hose* be worn, or the square holes the *Hose* Works in, it may for the present be botcht up by putting *Scaboards* between the *Hose* and the square holes of the *Till*; but to mend it perfectly either another *Till* must be made, or a new *Hose*, or both.

If the *Garter* be worn too wide; the *Smith* must either mend the *Old*, or make a new one.

If the *Worms* of the *Nut* or *Spindle* be worn, the *Spindle* must be examin'd by the *Smith*, and made true, and have a new *Nut* Cast on it.

If the *Toe* of the *Spindle* and its *Nut*, or either of them be worn irregularly, it is *Smiths* Work to mend.

If the *Tennants* in the *Head* have too much *Play* in their *Mortesses*; which though it seldom happens, yet if the *Head* were not made of well seasoned Stuff, the *Tennants* may be subject to shrink, and so have too

too much play. There is no substantial remedying this fault, but by making a new *Head*.

If an unproper temperature of the *Tympan* be the cause; that is, when it is dry in one place and moist in another, the dried place may by its spring force the Paper against the *Face* of the *Letter*, and in part. Print it before it come to feel the force of the *Plattin*; (but this is rather slurring than *Doubling*) and when the force of the *Plattin* does come, the spring in the dried part will again remove the Paper, and the force of the *Plattin* gives its full Impression where the Paper is thus removed, but when it is real *Doubling*, it happens generally on the whole Sheet.

This *Doubling* or *Slurring* is mended, by reducing the driest part of the *Tympan* to an equal moist temperature with the moistest.

Doubling often happens in the middle of the *Form*, and the reason is, because the foreside of the *Plattin* Prints beyond the middle of the *Form* at the first *Pull*, and the hindside of the *Plattin* by the *Second Pull* reprints part of the *First Pull*: So that a Spring in the *Tympan* removes the Paper in this interval of Time.

This fault is mended by exact observing the *Running* in of the *Carriage*.

Doubling may also happen by the too loose and flapping straining of the *Tympan*, when it was first *Drawn*.

This cannot be mended without taking the *Tympan* off, and *Drawing* on a new one.

A *Press-man* having *Pull'd* a Sheet, may by some accident (either of Object or Discourse) let it ly on the

Form after he has *Run-out* the *Carriage*, and afterwards forget it was *Pull'd*, yet may perhaps lift the *Tympan* a little off the *Form*, which lifting off (if the *Joynts* are not very good) will remove the *Sheet*, if then he *Pull* it again, it will *Double*.

This fault because it is but an accident I shall pass by, and only say,

If the *Joynts* are so faulty (as sometimes Old *Joynts* are) that the *Prefs-man* cannot keep *Register* with them, the *Smith* must make new or mend the Old.

9. When the *Prefs-man* leaves Work at Noon, he draws half the *Nails* out of the *Balls*, and takes the *Wooll* out : Then doubles the loose half of the *Leather* over the remaining *Nail'd-on* half, with the *Incky sides* of each half next each other, and Rows up the *Leathers* close, and laies them in a *Bowl* or *Pan* of *Water* to Soak till he has Din'd.

He also covers the *Form* with the *Tympan*, to keep it from dust or filth that may fall on it : And takes out the *Blankets* and lays them on the *Heaps* : And with a *Sponge* Wet in *Water* besprinkles the backside of the *Tympan*, to Soak it whiles he is at Dinner.

Coming again to his Work afternoon, he takes the *Handles* of the *Ball-stocks* between his *Thighs*, (being seated as before, when he knockt up the *Balls*, ¶ 10.) to hold them fast, and he takes the turn'd down backside of the *Ball-leathers* in both his hands, (for the other side being all over Black, would black his Hands) and rubs them between his *Fingers* very well, to supple them. Then squeezes and Wrings the *Water* well out again; and Teizes his *Wooll*, by opening

opening all the hard and almost matted knots he finds in it : but he does not pull the Wooll or hardned knots in it assunder from the whole mass of Wooll : But endeavours to keep the Wooll of each *Ball* intirely connected in the same mass, and only opened, to Loosen and Soften it : For pulling the knots to pieces, would tear the Wooll, and soon make it unfit for use. Having *Teazed* the *Wooll* he *Knocks up* his *Balls* again, as I shewed in ¶ 10.

Then he goes to the *Tympan*, and squeezing his *Sponge* as dry as he can, he rubs it over the backside of the *Tympan*, to Suck up the Water, that may lye on it.

Then taking the *Blankets*, he rubs them between both his Hands to soften them ; for we must suppose that the Mornings *Pulling* on them has compacted and hardned them : being well Rub'd, he lays them in the *Tympan* again, as was shewed before in ¶ 7. and falls again to his Afternoons train of Work.

Having wrought all day, though his *Form* be not *Wrought off*, it may yet be *Foul*, so that he must *Wash* it : Nay, in small *Letter* a good *Press-man* will *Wash* his *Form* twice a day : Wherefore he calls to the Boy to Heat the *Ly*, somewhat before he is ready for it, about a Heating time : And having a *Shooting-stick* lying by him on the *Till* or some other convenient place, drives every *Quoin* between the *Furniture* and the *Chase* fast up ; least they may have somewhat shrunk, or else started back : Then with a piece of Chalk he makes a score on the two farthermost *Corners* of the *Carriage* ; and through the *Quoins* droven against them, and upon the two *Corners* of the

Carriage of the *Tympan* and their *Quoins*, and lets the *Quoins* ly; but he *Unlocks* all the opposite *Quoins*, and takes them out of their places; laying those *Quoins* that he takes from between the fore-end of the *Carriage* and the *Chafe* on the hithermost upper long side of the *Plattin*, the hithermost *Quoin* on the hithermost side of the *Plattin*, and the farthestmost *Quoin* on the farthestmost side of the *Plattin*; with their small ends towards him, and fromwards him as they lay on the *Carriage*. The *Quoins* that he takes from the hither side of the *Carriage*, he lays on the hithermost Return side or end of the *Plattin*; that on his Left Hand on the *Carriage*, towards the farther Corner of the *Plattin*, and that *Quoin* on the Right Hand on the *Carriage*, towards the hither corner of the *Plattin*, with their small ends towards the Hand they lay on, on the *Carriage*.

Having taken out and placed these four *Quoins*, he tryes if the *Form* will *Rise*, as was shewed § 22. ¶ 7. then takes up the *Form*, and carries it to the *Ly-Trough*, and lays it in it, even as the *Compositer* brought the *Form* to the *Press*, and laid it on the *Press-stone*. § 22. ¶ 7. and taking the *Ly Kettle*, or *Chaser*, in his Left Hand pours the *Ly* Scalding hot place by place over the whole *Form*: And then with the ends of the Hair of the *Ly Brush* rubs gently over the whole *Form*: And as he thus *Rubs* with his Right Hand Rocks the *Ly-Trough* a little on its Axis, that the Body of *Ly* may accompany the *Ly-Brush* in its progress from the hither to the farther side of the *Form*: And thus he *Washes* the *Form* still on, till he perceive the *Face* of the *Letter* purely clean. Then

Then he lets the *Ly* out again into the *Ly-Kettle* at the Hole and Pipe in the Left Hand hither corner of the *Ly-Trough*: and stopping the hole again, sets by the *Ly-Kettle*. Then with a Dish or two of fair Water he *Rinces off* the Laver of the *Ly* that may ly on the Face of the *Letter*, and rears up the *Form* and throws a Dishful or two of fair Water on the back-side of it, to *Rince* it also. Then takes the *Form* out of the *Ly-Trough*, and sets it by, shelving with its Face against the Wall, to Dry.

If the *Heap* be *Wrought off*, he lets the *Compositer* know it, to take Charge of it.

Having *Wrought off* his *Heap*, he takes it off the *Paper-bench*, and sets it by on the floor, covering it with a Waste-sheet: And gives notice to the Boy, or to the *Ware-house-keeper*, to fetch it away and Hang it up to Dry.

Then he draws the *Balls*, and takes the *Blankets* out of the *Tympan* (as at Noon:) And if he have Paper to *Wet*, *Wets* it as was shewed ¶ 9. of this §.

§ 25. *The Office of the Warehouse-keeper.*

¶ 1. *Of Hanging up Paper.*

THE *Warehouse-keeper* takes the *Heap* out of the *Press-room*, and carries it into the *Warehouse*, or other *Drying-place*, and setting it upon a *Form* or *Bench* of convenient heighth, with an end of the *Heap* from him, he takes the *Handle* of the *Peel* in his Left Hand, and lays the *Board* flat down upon the *Heap*, with the Left Hand side of the *Board* towards

wards the Left Hand side of the *Heap*, and so as its upper edge may reach to almost three quarters of the length of the Sheet, and that the Right Hand end of the *Peel* may ly on the middle of the *Heap*: Then with his Right Hand he doubles over so much of the *Heap* as he thinks good; perhaps about a *Quire*, or half a *Quire*, or about seventeen Sheets, more or less, either as he can allow them time to Dry, or have room on his *Racks* to *Hang* them on. Having thus doubled his first *Doubling* on the *Heap*, he removes the Left Hand half of the *Peel* almost off the *Heap*, viz. to about two Inches within the Left Hand side of the *Heap*, and doubles, as before, a second *Doubling* to hang over the first *Doubling*, towards the Left Hand about two Inches, as aforesaid, on the *Peel*, and as near as he can guess, the same number of Sheets. And having these two *Doublings* on his *Peel*, he takes the *Peel* off the *Heap*; and holding the *Handle* a little aslope, that the *Shorter Folding-over* of the Sheets may open from the *Peel*, he lifts it up, and places it at one end of his first *Rack*, and lets it hang on it, by drawing the *Peel* from under the Paper. In like manner he Loads and unloads his *Peel* again successively, till he have *Hung up* the whole *Heap*. See Plate 31.

Note, that the sides of the Sheets do not hang against one another, but lap over one another, as you may see by Plate 31. Nor are they *Hung up* to *Hang* with their edges against the side of the former *Hanging-up*, but to lap over, so as every Right Hand *Doubling* may lap about two Inches over the Left Hand *Doubling*; that when the *Books* are taken down, the

the *Warehouse-keeper* clapping the flat side of his *Peel* against the Right Hand edge of the Paper, slides several *Doublings* over one another (perhaps three or four :) And putting the *Peel* under them, takes them off the *Racks*, and lays them on the *Heap* again, on a clean Waste Paper, and sets the *Heap* orderly by, till it comes to be *Gather'd*.

The *Warehouse-keeper* is also very careful to lay all the Sheets, so as the respective *Signatures* of every Sheet may ly exactly over the respective *Signature* of the first Sheet, lest when the *Books* come to be *Gathered*, some Sheets may be *Turned*, which will give him a great deal of trouble to *Turn* them right when he *Colations* the *Books*.

¶ 2. Of Laying the Heaps.

Laying the Heaps is to place them on Benches or Forms of a convenient Heighth, in an orderly *Signatural* Succession. By an orderly *Signatural* succession, I mean the first *Signature*, which most commonly is A (and therefore shall be so accepted) be placed on the Left Hand of the Bench, with either the Side or Foot of the *Page*, as the *Volume* requires, that hath the single *Signature* A at the bottom of it upwards, and towards the hither side of the Bench. On the Right Hand side of the *Heap* A is B, and next it C, in like order DEF, &c.

¶ 3. Of

¶ 3. Of Gathering of Books.

Gathering of Books is to take one Sheet off every *Heap*, beginning at the last *Heap* first, viz. at the Left Hand end of the Range. The *Gatherer* takes it off with his Right Hand, and disposes the hither end of the Sheet into his Left Hand, clapping his Left Hand Thumb upon the middle of the Sheet, to hold it fast. Then he takes a second Sheet off the second *Heap* from the Left Hand, viz. towards the Right; and lays the second Sheet on the first, and so successively a third, a fourth, a fifth, &c. till he has *Gathered* the last Sheet on his Right Hand; still observing to lay the middle of each Sheet under his Thumb, and all the single *Signatures* on each Sheet orderly and successively on one another.

Thus he *Gathers* on, till one of all the *Heaps* Comes off; which when it does, he Doubles or Quires up all the other *Heaps*, and lays them by till he can *Bundle* and Tye them up; which when he has also done, he writes upon them *Imperfections* of (the *Title* of the *Book*) and Writes on it the *Signature* of the Sheet that is Wanting, and sets it by in a convenient place of the *Warehouse*, that he may have recourse to it on any occasion.

Though I shewed how he *Gathered* the *Books*, yet shewed not how he *Knocks them up* and *Folds* them: Wherefore,

Having thus *Gathered* one *Book*, he *Knocks it up*, that is, he carries it to a Table provided on purpose

pose near him; and taking the ends of the *Book* between the two Bows of the Thumb and Fore-finger of each Hand, he grasps the ends loosely between them, and placing the hither long side or edge of the *Book* on the plain of the Table, he lifts the whole *Book* a little above the plain of the Table, (about an Inch or two, more or less) and while the whole *Book* is held loosely by its ends, lets it fall gently down on the Table, that the edges of such Sheets as may stand out, or lower than the rest, may be drove even with the rest of the edges of the *Book*, and also that the edges of such Sheets as may lye above the edges of the *Book* may be jolted downwards, and lye even in the same Range with the rest of the edges.

And as he is *Knocking up* the lower edge of the *Book*, he at the same time evens the two ends of the *Book*, by thrusting the Bows of his Thumbs and Fingers against the ends of the *Book*, which being loosely grasp'd, and the Bows of his Thumbs and Fingers bearing pretty stiff towards each other, will drive in the ends of such Sheets as may stick out at either end; and so even the ends of the *Book* at the same time.

Having thus even'd all the edges, he lays the *Book* flat down on the Table, and holding one end of it stiff and tight in his Left Hand, he rubs the whole flat of his Right Hand hard upon the upper Sheet, to press it and all the other Sheets as close together as he can; then takes it up, and gives the edges another or two gentle *Knocks*, as before; and then *Folds up*, or *Doubles* the *Book*, according to its respective *Volumen*. A a a If

If it be *Folio*, *Quarto*, *Octavo* or *Sixteens*, he *Folds* it in the *Short Cross*; but if it be *Twelves*, *Eighreens*, *Twenty-fours*, he *Folds* it in the *Long Cross*.

But most times before he *Folds* the *Books* he will *Colation* them: (as shall be shewed by and by:) therefore having *Gathered* the *Book*, he lays it by on a Sheet of Waste Paper, and *Gathers* a second *Book* as he did the first, and lays that flat open on the first, then *Gathers* a third, fourth, fifth *Book*, &c. as before, and lays them successively on each other, till he have raised an *Heap* of *Books* so high, that he grows cautious of laying more on, lest its height should exceed his management. Then *Gathers* on, and raises another *Heap* or *Heaps* till one of the *Signatures* comes off.

¶ 4. Of Colationing Books.

The *Colationing* of *Books*, is,

First, To examine whether the whole number of Sheets that belong to a *Book* are *Gathered* in the *Book*.

Secondly, To examine that two Sheets of one sort are not *Gathered*:

Thirdly, To examine whether the proper *Signature* of every Sheet lye on its proper corner of the *Gathered Book*.

To do this, The *Colationer* provides himself with a *Bodkin*; which is nothing else than a pretty thick Sowing Needle, (most commonly broken-eyed,) having its thick end thrust fast into a round piece of Wood, about the thickness of a Tobacco-Pipe, and about three or four Inches long.

Now

Now having the *Heap* of *Gathered Books* before him, with the single *Signature A* lying upwards on his Right Hand, and his Left Arm cross the *Heap*, and his Hand near the *Signature* corner, with his *Bodkin* in his Right Hand, he pricks up the corner of the first Sheet *A*, and at the same moment he pricks it up, slips the Balls of his two Fore-fingers of his Left Hand, and secures it from falling back again on the *Gathered Heap* of *Books* between his Thumb and hinder Joynt of his Fore-finger, and immediately pricks into the Sheet *B*, casting his Eye upon the *Signature*, as well to see that it is *B*, as to see that it is singly *B*, and not *B 2*, *B 3*, &c. For if the single *Signature* lye not on the same corner of the *Heap*, the Sheet must be turned till it do. In like manner he picks up and receives *C D*, &c. still casting his Eye that it be the right *Letter*, and single *Signature*, as aforesaid.

If he finds two Sheets of the same *Signature*, he takes one out and lays it by, or else on the *Heap*, if they be not all *Gathered*.

If he finds one Sheet wanting, he fetches that Sheet from the *Heap*; or if he want it at the *Heap* the *Book* is laid by as *Unperfect* till he have *Colationed* the whole *Impression* of *Books*, to see if he can make it *Perfect* with some other *Book*, that may have two of the same Sheets *Gathered* in it.

Having examined that his *Book* is *Perfect*, he *Knocks* and *Folds* it up, as was shewed in the last ¶.

Having *Gathered*, *Colationed* and *Folded* these *Books*, he *Tells* them, to see how the *Impression* *Holds* out; and as he *Tells* them, he lays a set number of

A a a 2

Books

Books (if the *Books* be *Thick*, five, if *Thinner*, Ten, if very *Thin*, twenty five or fifty) with the *Folded Side* or *Back* one way, and the same *Number* of *Books*, with the *Folded* or *Back-side* the other way, viz. the edges of the latter number of *Books* upon the *Backs* of the former *Number*: As well to distinguish and Count the *Number* of *Books* readily, as to keep the Bundle in a flat and Horizontal position. For if the *Backs* of the *Quired Books* in a Bundle, should lye all one way, the *Fold* of the *Back* being more or less hollow in the middle of each *Book*, will in a *Number* of *Books*, by springing upwards, mount the *Backs*; and consequently the edges of the *Books* in the Bundle will be depressed, so that in a great Bundle the *Books* will be subject to slide off one another.

These *Books* being thus Counted, he sets them by on Waste Paper in convenient Piles, viz. Piles of about three or four Reams high (according as the Paper may be thicker or thinner) he sets them by (I say) in Piles of equal Numbers, Range by Range, till the whole *Impression* is set by.

And before he Tyes them up, he puts them into the *Standing Press*, placing in it so many *Books* as the *Press* will hold, both in width and Heighth; observing to set in every *Pile* he puts Range by Range into the *Press*, an equal number of *Books*, that each *Pile* may equally feel the force of the Screw.

Then with a strong Iron Bar he turns about the *Spindle* as oft as he can, with his main Strength to Squeeze and *Press* the *Books* as close and tight as he can together: and so lets them stand in *Press* about
a Day

a Day and a Night. Then takes them out, and in like manner puts in more *Books*, till the whole Impression is *Preſt*. See Plate 32.

As he takes each number of *Books*, he Tyes them up with Packthred, lays a Waſte Paper under and upon each *Bundle*; and if the *Maſter-Printer* Printed the *Impreſſion* for Himſelf, he writes the *Title* of the *Book*, and number of the *Books* on the uppermoſt Waſte Paper, and ſets them by ſquare and orderly on the Shelves in the *Warehouse*, to deliver them out according to the *Maſter-Printers* order. But if the *Impreſſion* were Printed for an Author, or a Book-feller, he ſends them to the Authors or Book-fellers, without writing on the uppermoſt Waſte Paper.

¶ 5. *Of Setting out Paper, and Culling the Cording Quires.*

Each Ream of Paper contains twenty *Quires*: Theſe twenty *Quires* are by the Paper-makers ſo diſpoſed that the Back or Doubling of each *Quire* lyes upon the opening or edges of the next *Quire*: For reaſons given in the laſt ¶.

Two of the twenty *Quires* in a Ream are called *Cording Quires*, viz. the two *Out-ſide Quires*; becauſe the whole Ream is Corded or Tyed up between them. They are alſo called *Caffe Quires*, becauſe they ſerve for Caſes to the Ream. Theſe *Quires* are by the Paper-maker made up of torn, wrinckled, ſtained, and otherwiſe naughty Sheets; yet does not perhaps the whole *Quire* conſiſt of ſuch Sheets, but commonly

A a a 3

ſome

some good Sheets are in *Culling* found among them, as shall be farther shewed by and by.

The *Warehouse-keeper* therefore when he *Sets out* Paper, lays by the uppermost *Cording Quire*, and then nimbly snatches with his Right Hand at the back of the next *Quire*, and if the back lye towards him, draws it into his Left Hand with the edges of the *Quire* towards his Fingers; but if the back lye from him, nimbly turns it while it is coming to his Left Hand, and so again nimbly snatches at the back of the succeeding *Quires*, placing their backs all one way on the First *Quire* in his Left Hand, till he have Counted or taken off of the Ream a *Token*; which *Token*, if it be set out for *Half a Press*, viz. a *Single Press-man*, is generally but five *Quires*, and is indeed often called *Half a Token*: But if it be for an *Whole Press*, it contains Ten *Quires*. This *Token* he lays by near him, upon a Waste Sheet of Paper, and again applies himself to *Set out* the next *Token* in the same manner, but lays the next *Token* with the backs of the *Quires* over the edges of the former *Token*, and thus *Sets out* so many *Tokens* as his *Heap* requires, yet always considers how his Paper *Holds out*, whether five and twenties, or but four and twenties: If it *Holds out* five and twenties, he *Sets out* in every Fourth, Fifth, or Sixth *Token* Eleven *Quires*, to secure the *Impression* to *Hold out*. If but four and twenties, he *Sets out*, Eleven *Quires*, in every second *Token*, and at last a *Quire* more to the whole *Heap* to make good the wanting Sheets of every *Quire*, and to make *Proves*, *Revises*, *Register-Sheets*, *Tympan-Sheets*, and to supply other accidents that may happen at the *Press*,
either

either by naughty Sheets, or Faults committed in *Beating, Pulling, Bad Register, &c.* for all or any of these accidents that happens to a Sheet, the *Press-man* doubles it, and lays by in the *Heap* as Waste, as I shewed § 24. ¶ 18. (4) and still he remembers, as aforesaid to lay by the two *out-side Quires* of every Ream; and at last lays on the *Heap* another Waste Sheet of Paper, and so brings it to the *Press* to be *Wet*.

The *Culling the Cording Quires*, is, to examine every Sheet one by one. To do it, he lays the *Cording Quires*, or many *Cording Quires* open before him against the Light, and takes up every Sheet successively and observes the goodness of it: Such Sheets as he finds good, he lays on his Right Hand, and the Bad on his Left. If a Sheet have but a little corner torn off, *viz.* so much as he judges the *Book-binder* would take off with his *Plow*, to make the *Leaf* square with other *Leaves*, he accounts that a good Sheet: But if more be torn off, he lays it by for Bad; and so he does Wrinckled and stain'd Sheets.

Having thus *Cull'd* all the *Cording Quires*, he tells out the good Paper into *Quires*, allowing five and twenty to the *Quire*, if the *Quires* of the Ream hold out five and twenty; or else but into four and twenty. And the good Paper thus *Cull'd*, he tells into an *Heap* or *Heaps*, as far as it will go.

But yet the careful *Warehouse-keeper* will not give the *Press-man* this *Cull'd* Paper to Print at the beginning or end of a *Book*; but disposes that *Heap* or *Heaps* so as they may be used about the middle of the *Book*: For though we call'd it good Paper, yet it very rarely

ly happens to be so beautiful as the *Inside Quires*.

The Bad Paper he also *Tells out* into *Quires*, but allows no more than four and twenty Sheets to the *Quire*, because it is commonly set by in the *Warehouse* to be fold.

It is also the Office of the *Warehouse-keeper* to keep a Day Book, and in it to set down what Books he Sells, and for how much, and to whom, and whom by order of the *Master-Printer* he Trusts with Books, and for how long Time; that so the *Master-Printer* may as oft as he pleases have an account how the *Impression*, or part of it, is disposed of.

(*As an Appendix.*) *Ancient Customs used in a Printing-house.*

EVERY *Printing-house* is by the Custom of Time out of mind, called a *Chappel*; and all the Workmen that belong to it are *Members of the Chappel*: and the Oldest Freeman is *Father of the Chappel*. I suppose the Stile was originally conferred upon it by the courtesie of some great Churchman, or men, (doubtless when Chappels were in more veneration than of late years they have been here in *England*) who for the Books of Divinity that proceeded from a *Printing-house*, gave it the Reverend Title of *Chappel*.

There have been formerly Customs and By-Laws made and intended for the well and good Government of the *Chappel*, and for the more Civil and orderly deportment of all its Members while in the *Chappel*; and the Penalty for the breach of any of these

these Laws and Customs is in Printers Language called a *Solace*.

And the Judges of these *Solaces*, and other Controversies relating to the *Chappel*, or any of its Members, was plurality of Votes in the *Chappel*. It being asserted as a Maxim, *That the Chappel cannot Err*. But when any Controversie is thus decided, it always ends in the Good of the *Chappel*.

1. Swearing in the *Chappel*, a *Solace*.
2. Fighting in the *Chappel*, a *Solace*.
3. Abusive Language, or giving the Ly in the *Chappel*, a *Solace*.
4. To be Drunk in the *Chappel*, a *Solace*.
5. For any of the Workmen to leave his Candle burning at Night, a *Solace*.
6. If the *Compositer* let fall his *Composing-stick*, and another take it up, a *Solace*.
7. Three *Letters* and a *Space* to lye under the *Compositers Case*, a *Solace*.
8. If a *Press-man* let fall his *Ball* or *Balls*, and another take it up, a *Solace*.
9. If a *Press-man* leave his *Blankets* in the *Tympan* at Noon or Night, a *Solace*.

These *Solaces* were to be bought off, for the good of the *Chappel*: Nor were the price of these *Solaces* alike: For some were 12 d. 6 d. 4 d. 2 d. 1 d. *ob.* according to the nature and quality of the *Solace*.

But if the Delinquent prov'd Obstinate or Refractory, and would not pay his *Solace* at the Price of the *Chappel*; they *Solac'd* him.

The manner of *Solacing*, thus.

The Workmen take him by force, and lay him on

B b b

his

his Belly athwart the *Correcting-stone*, and held him there while another of the Work-men, with a Paper-board, gave him 10 l. and a *Purse*, viz. Eleven blows on his Buttocks; which he laid on according to his own mercy. For Tradition tells us, that about 50 years ago one was *Solaced* with so much violence, that he presently Rissed Blood, and shortly after dyed of it.

These nine *Solaces* were all the *Solaces* usually and generally accepted: yet in some particular *Chappels* the *Work-men* did by consent make other *Solaces*, viz.

That it should be a *Solace* for any of the *Work-men* to mention Joyning their Penny or more apiece to send for Drink.

To mention spending *Chappel-money* till *Saturday Night*, or any other before agreed time.

To Play at *Quadrats*, or excite any of the *Chappel* to Play at *Quadrats*; either for Money or Drink.

This *Solace* is generally Purchas'd by the Master-Printer; as well because it hinders the Workmens work, as because it Batters and Spoils the *Quadrats*: For the manner how they Play with them is Thus: They take five or seven more in *Quadrats* (generally of the *English Body*) and holding their Hand below the Surface of the *Correcting Stone*, shake them in their Hand, and toss them up upon the *Stone*, and then count how many *Nicks* upwards each man throws in three times, or any other number of times agreed on: And he that throws most Wins the Bett of all the rest, and stands out free, till the rest have try'd who throws fewest *Nicks* upwards in so many throws; for all the rest are free: and he pays the Bett.

For

For any to *Take up a Sheet*, if he receiv'd *Copy-money*; Or if he receiv'd no *Copy-money*, and did *Take up a Sheet*, and carryed that Sheet or Sheets off the Printing-House till the whole Book was Printed off and Publisht.

Any of the Workmen may purchase a *Solace* for any trivial matter, if the rest of the *Chappel* consent to it. As if any of the Workmen Sing in the *Chappel*; he that is offended at it may, with the *Chappels* Consent purchase a penny or two penny *Solace* for any Workmans singing after the *Solace* is made; Or if a Workman or a Stranger salute a Woman in the *Chappel*, after the making of the *Solace*, it is a *Solace* of such a Value as is agreed on.

The price of all *Solaces* to be purchased is wholly Arbitrary in the *Chappel*. And a Penny *Solace* may perhaps cost the Purchaser Six Pence, Twelve Pence, or more for the *Good of the Chappel*.

Yet sometimes *Solaces* may cost double the Purchase or more. As if some *Compositer* have (to affront a *Press-man*) put a Wisp of Hay in the *Pressmans Ball-Racks*; If the *Press-man* cannot well brook this affront, he will lay six Pence down on the *Correcting Stone* to purchase a *Solace* of twelve Pence upon him that did it; and the *Chappel* cannot in Justice refuse to grant it: because it tends to the *Good of the Chappel*: And being granted, it becomes every Members duty to make what discovery he can: because it tends to the farther *Good of the Chappel*; And by this means it seldom happens but the Aggressor is found out.

Nor did *Solaces* reach only the *Members of the*

B b b 2

Chap-

Chappel, but also Strangers that came into the *Chappel*, and offered affronts or indignities to the *Chappel*, or any of its Members; the *Chappel* would determine it a *Solace*. Example,

It was a *Solace* for any to come to the *Kings Printing-house* and ask for a Ballad.

For any to come and enquire of a *Compositer*, whether he had News of such a Galley at Sea.

For any to bring a Wisp of Hay, directed to any of the *Press-men*.

And such Strangers were commonly sent by some who knew the *Customs of the Chappel*, and had a mind to put a Trick upon the Stranger.

Other Customs were used in the *Chappel*, which were not *Solaces*, viz. Every new Workman to pay half a Crown; which is called his *Benvenue*: This *Benvenue* being so constant a Custome is still lookt upon by all Workmen as the undoubted Right of the *Chappel*, and therefore never disputed; yet he who has not paid his *Benvenue* is no Member of the *Chappel*, nor enjoys any benefit of *Chappel-Money*.

If a Journey-man Wrought formerly upon the same Printing House, and comes again to Work on it, pays but half a *Benvenue*.

If a Journey-man Smout more or less on another Printing House, and any of the *Chappel* can prove it, he pays half a *Benvenue*.

I told you before that abusive Language or giving the Lye was a *Solace*: But if in discourse, when any of the Workmen affirm any thing that is not believed, the *Compositer* knocks with the back corner of his *Composing-stick* against the lower Ledge of his *Lower Case*,

Cafe, and the *Press-man* knocks the Handles of his *Ball-stocks* together : Thereby signifying the discredit they give to his Story.

It is now customary that Journey-men are paid for all Church Holy days that fall not on a *Sunday*, Whether they Work or no : And they are by Contract with the Master Printer paid proportionably for what they undertake to Earn every Working day, be it half a Crown, two Shillings, three Shillings, four Shillings, &c.

It is also customary for all the Journey-men to make every Year new Paper Windows, whether the old will serve again or no ; Because that day they make them, the Master Printer gives them a *Way-goose* ; that is, he makes them a good Feast, and not only entertains them at his own House, but besides, gives them Money to spend at the Ale-house or Tavern at Night ; And to this Feast, they invite the *Correcter*, *Founder*, *Smith*, *Joyner*, and *Inck-maker*, who all of them severally (except the *Correcter* in his own Civility) open their Purse-strings and add their Benevolence (which Workmen account their duty, because they generally chuse these Workmen) to the Master Printers : But from the *Correcter* they expect nothing, because the Master Printer chusing him, the Workmen can do him no kindness.

These *Way-gooses*, are always kept about *Bartholomew-tide*. And till the Master-Printer have given this *Way-goose*, the Journey-men do not use to Work by Candle Light.

If a Journey-man marry, he pays half a Crown to the *Chappel*.

When his Wife comes to the *Chappel*, she pays six Pence : and then all the Journey-men joyn their two Pence apiece to Welcome her.

If a Journey-man have a Son born, he pays one Shilling.

If a Daughter born, six Pence.

The *Father* of the *Chappel* drinks first of *Chappel Drink*, except some other Journey-man have a *Token*; viz. Some agreed piece of Coin or Mettle markt by consent of the *Chappel*: for then producing that *Token*, he Drinks first. This *Token* is always given to him who in the Round should have Drank, had the last *Chappel-drink* held out. Therefore when *Chappel-drink* comes in, they generally say, *Who has the Token?*

Though these Customs are no *Solaces*; yet the *Chappel* Excommunicates the delinquent; and he shall have no benefit of *Chappel-money* till he have paid.

It is also Customary in some Printing-houses that if the *Compositer* or *Press-man* make either the other stand still through the neglect of their contracted Task, that then he who neglected, shall pay him that stands still as much as if he had Wrought.

The *Compositors* are Jocosely call'd *Galley Slaves*: Because allusively they are as it were bound to their *Galies*.

And the *Press-men* are Jocosely call'd *Horses*: Because of the hard Labour they go through all day long.

An Apprentice when he is Bound pays half a Crown to the *Chappel*, and when he is made Free, another half Crown to the *Chappel*; but is yet no Member of the *Chappel*; And if he continue to

Work

Work Journey-work in the same House, he pays another half Crown, and is then a Member of the Chappel.

A *Founding-House* is also call'd a *Chappel*: But I suppose the Title was originally assum'd by *Founders*, to make a Competition with *Printers*.

The Customes used in a *Founding-House* are made as near as may be. to those of a *Printing-house*: but because the Matter they Work on, and the manner of their Working is different, therefore such different Customes are in Use, as are suitable to their Trade, As

First, To call *Mettle Lead*, a Forfeiture.

Secondly, A Workman to let fall his *Mold*, a Forfeiture.

Thirdly, A Workman to leave his *Ladle* in the *Mettle* Noon or Night, a Forfeiture.

The *Printers of London*, Masters and Journey-men have every Year a general Feast, which since the re-building of *Stationers Hall* is commonly kept there. This Feast is made by four Stewards, viz. two Masters and two Journey-men; which Stewards, with the Collection of half a Crown a piece of every Guest, defray the Charges of the whole Feast; And as they Collect the Half-Crowns, they deliver every Guest a Ticket, wherein is specified the Time and Place they are to meet at, and the Church they are to go to: To which Ticket is affixed the Names and Seals of each Steward.

It is commonly kept on or about *May-day*: When, about ten a Clock in the Morning they meet at *Stationers Hall*, and from thence go to some Church thereabouts; Four Whiffers (as Servitures) by two

and

and two walking before with White Staves in their Hands, and Red and Blew Ribbons hung Belt-wise upon their left Shoulders. These go before to make way for the Company. Then walks the Beadle of the Company of *Stationers*, with the Companys Staff in his Hand, and Ribbons as the Whiffers, and after him the Divine (whom the Stewards before engag'd to Preach them a Sermon) and his Reader. Then the Stewards walk by two and two, with long White Wands in their Hands, and all the rest of the Company follows, till they enter the Church.

Then Divine Service begins, Anthems are Sung, and a Sermon Preached to suit the Solemnity: Which ended, they in the same order walk back again to *Stationers Hall*; where they are immediately entertain'd with the City Weights and other Musick: And as every Guest enters, he delivers his Ticket (which gives him Admittance) to a Person appointed by the Stewards to receive it.

The Master, Wardens and other Grantees of the Company (although perhaps no Printers) are yet commonly invited, and take their Seats at the upper Table, and the rest of the Company where it pleases them best. The Tables being furnish'd with variety of Dishes of the best Cheer: And to make the entertainment more splendid is Usher'd in with Loud Musick. And after Grace is said (commonly by the Minister that Preach'd the Sermon) every one Feasts himself with what he likes Best; whiles the Whiffers and other Officers Wait with Napkins, Plates, Beer, Ale, and Wine, of all sorts, to accommodate each Guest according to his desire. And to
make

make their Cheer go cheerfuller down, are entertained with Musick and Songs all Dinner time.

Dinner being near ended, the Kings and the Dukes Healths is begun, by the several Stewards at the several Tables, and goes orderly round to all the Guests.

And whiles these Healths are Drinking, each Steward sets a Plate on each Table, beginning at the upper end, and conveying it downwards, to Collect the Benevolence of Charitable minds towards the relief of *Primmers* Poor Widows. And at the same time each Steward distributes a Catalogue of such Printers as have held Stewards ever since the Feast was first kept, viz. from the Year of Christ 1621.

After Dinner, and Grace said, the Ceremony of Electing new Stewards for the next Year begins: Therefore the present Stewards withdraw into another Room: And put Garlands of Green Lawrel, or of Box on their Heads, and White-wands in their Hands, and are again Usher'd out of the withdrawing Room by the Beadle of the Company, with the Company's Staff in his Hand, and with Musick sounding before them: Then follows one of the Whiffers with a great Bowl of White-wine and Sugar in his Right Hand, and his Whiffers Staff in his Left: Then follows the Eldest Steward, and then another Whiffler, as the first, with a Bowl of White-wine and Sugar before the second Steward, and in like manner another Whiffler before the Third, and another before the Fourth. And thus they walk with Musick sounding before them three times round the Hall: And in a fourth round the first Steward takes

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the

the Bowl of his Whiffer and Drinks to one (whom before he resolved on) by the Title of Mr. Steward Elect: And taking the Garland off his own Head puts it upon the Steward Elects Head. At which Ceremony the Spectators clap their Hands, and such as stand on the Tables or Benches, so Drum with their Feet that the whole Hall is filled with Noise, as applauding the Choice. Then the present Steward takes out the Steward Elect, giving him the Right Hand, and walks with him Hand in Hand, behind the three present Stewards another Round about the Hall: And in the next Round, as afore said, the second Steward Drinks to another with the same Ceremony as the first did; and so the Third Steward, and so the Fourth, and then all walk one Round more Hand in Hand about the Hall, that the Company may take notice of the Stewards Elect: And so ends the Ceremony of the Day.

This Ceremony being over, such as will go their ways; but others that stay, are Diverted with Musick, Songs, Dancing, Farcing, &c. till at last they all find it time to depart.

A
DICTIONARY,

Alphabetically explaining the abstruse
VVords and Phrases that are used in
Typography. VVhich also may serve as
an Index to direct to the most material
Concerns contained in this Volumn.

THough I give you a Dictionary of so many
Words and Phrases as are mentioned in these
Exercises, yet I do not exhibit this as a *Di-*
ctionary so perfect, that all the obstruce
Words and Phrases used among *Printers*, *Letter-*
cutters and *Founders* are here exposed; for Words
and Phrases many times offer themselves either as
Discourse or Contemplation occurs: Therefore such
Words and Phrases as have escaped my Considerati-
on, will, I hope, be discovered by some Printer, or
others, that may have a kindness for Posterity; not
only in this Trade, but in all Trades and Faculties
whatsoever: That so a *Dictionary* may in time be
compleated, that may render so great a number of
Words used in *England* by *English-men* intelligible;
which now for want of a proper Repository to store
them in, seem not only Aliens to our Nation, but
barbarous to our Understandings.

A

Abbreviations are Characters, or else marks on *Letters*, to signifie either a Word or Syllable. & is the Character for And, ; is The abbreviated, † is That abbreviated; and several other such. Straight strokes over any of the Vowels abbreviates m or n. They have been much used by Printers in Old Times, to *Shorten* or *Get in Matter*; but now are wholly left off as obsolete.

Accented Letters are much used in *Latin* Authors, and more in *Greek*. The Vowels are only accented, and are called *Grave*, thus accented à; *Acute*, thus accented á; *Circumflex*, thus accented â; and *Deere-cis*, thus accented ä.

Accents are Dashes or Marks over the Vowels.

Air-hole. See § 18. ¶ 1. Vol. 2.

Ascending Gage. See § 12. ¶ 5. Vol. 2.

Asbes. *Letter-Founders* call the *Skimmings* of their *Mettle*, and the Sweepings of their House *Asbes*; and save both, to send to the Refiners; who with their fierce Fire draw all the *Mettle* out of the *Asbes*. See *Fat Asbes*. See *Lean Asbes*.

Ash-hole. See § 18. ¶ 1. Vol. 2.

Affidue is Thin Brass Plate, such as adorns *Bartholomew-Fair* Hobby Horses: *Founders* use it to *Underlay* the *Body*, or the *Mouth-piece*, &c. of their *Mold*, if it be too Thin. See § 16.

B

Back of a Composing-stick. See § 9. ¶ 4. Vol. 2.

Backside of the Form is the under-side that touches upon the *Correcting-stone* or *Press-stone*.

Bad Copy. See § 24. ¶ 4. Vol. 2.

Bad

Bad work. Any Fault at the *Cafe*, or *Press*, or at the *Furnace*, or at the *Dressing-block*, &c. is in Workmens Language called *Bad Work*.

Bake. See § 22. ¶ 10. Vol. 2.

Balls. See § 24. ¶ 10. Vol. 2.

Ball-knife. An old blunt-edg'd Knife, that *Press-men* lay by, to scrape their *Balls* with.

Ball-leathers. See § 24. ¶ 10. Vol. 2.

Ball-Nails. The *Nails* that *Ball-leathers* are Tack't to the *Ball-stocks* with.

Ball-stocks. See § 11. ¶ 21. Vol. 2.

Balls Take. See § 11. ¶ 21. Vol. 2.

Beak. See § 12. ¶ 2. Vol. 2.

Beam. See § 12. ¶ 4. Vol. 2.

Beard of a Letter, is the outer angle of the Square Shoulder of the *Shank*, which reaches almost up to the *Face* of the *Letter*; and is commonly scraped off by the *Founder*: As in § 2. ¶ 2. Vol. 2.

Beard-Gage. See § 13. ¶ 4. Vol. 2.

Bearer. See § 4. & § 24. ¶ 7. Vol. 2.

Beat. See § 24. ¶ 13. Vol. 2.

Beat Fat. If a *Press-man* Takes too much *Inck* with his *Balls*, he *Beats Fat*. The *Black English Faced Letter* is generally *Beaten Fat*.

Beat Lean, is to *Take* but little *Inck*, and often: All *Small Letter* must be *Beaten Lean*.

Bed. See § 24. ¶ 2. Vol. 2.

Benvenue. See *Ancient Customs*, Vol. 2.

Bite. See § 24. ¶ 7. Vol. 2.

Blankets. Woollen Cloath, or White Bays, to lay between the *Tympans*.

Blocks. See § 20. ¶ 3. Vol. 2.

Block-Groove. *ibid.*

C c c 3

Body.

Body. See § 1. ¶ 2. & § 15. ¶ 1. Vol. 2.


Notching Matrices. See § 17. ¶ 3. Vol. 2.

Bottom line. See § 14. ¶ 2. Vol. 2.

Bottom of the Matrice. See § 17. ¶ 1. Vol. 2.

Bottom Plate. See § 15. ¶ 1. Vol. 2.

Bow. See § 15. ¶ 1. Vol. 2.

Brace, is a Character Cast in *Mettle* thus marked  The *Compositor* is to have these Cast of several Breadths, viz. to several numbers of *Lines* of a designed *Body* (most commonly of *Pica Body*) that they may hook in or Brace so many *Lines* as his *Copy* may shew him; as at *Charge* is a Brace of four *Lines*. See also § 24. ¶ 1. Vol. 2.

Brass-Rules. See § 2. ¶ 2. Vol. 2.

Brayer is a round *Wooden Rubber*, almost of the fashion of a *Ball-stock*, but flat at the bottom, and not above three Inches Diameter: It is used in the *Inck-Block* to *Bray* or *Rub Inck*.

Break, a piece of a *Line*. Also the *Mettle* that is contiguous to the *Shank* of a *New Cast Letter*: This *Break* is formed in the *Mouth-piece* of the *Letter-mould*, and is called a *Break*, because it is always broke from the *Shank* of a *Letter*.

Breaking off is breaking the *Break* from the *Shank* of the *Letter*. See § 19. ¶ 3. Vol. 2.

Brevier. See § 2. ¶ 2. Vol. 2.

Broad-side, a *Form* of one full *Page*, Printed on one side of a whole Sheet of Paper.

Broken Letter. By broken *Letter* is not meant the breaking of the *Shanks* of any of the *Letters*, but the breaking the orderly Succession the *Letters* stood in in a *Line*, *Page*, or *Form*, &c. and mingling the *Letters*

ters together, which mingled Letters is called *Py*.

Bur. See *Rag*.

C

Cannon. See § 2. ¶ 2. Vol. 2.

Card. When several *Bodies of Letter* are Set in a *Page*, *Compositers* to Justifie that *Page* to an exact Length, put a *Card* to some *White-line*, or other *Break* and Lengthen out the *Page* the thickness of a *Card*. And *Press-men* also use a *Card* for an underlay. See § 22. ¶ 4. &c. § 24. ¶ 7.

Cards. About a Quire of Paper, which *Press-men* use to Pull down the Spring or rising of a *Form*, which it is many times subject to by hard *Locking-up*. See § 24. ¶ 4.

Carriage, is a part of the *Press*. For which See § 10. ¶ 9. Vol. 2. It is also a part of the *Letter-Mold*: For which See § 15. ¶ 3. Vol. 2.

Case. See § 3. Vol. 2.

Case lies. See § 22. ¶ 1.

Case is full, viz. a *Case* full of *Letter*, wanting no *Sorts*.

Case is Low. When a *Case* grows empty, *Compositers* say the *Case is Low*.

Case Stands still. When the *Compositor* is not at Work at his *Case*, it is said, *The Case stands still*.

Cassie Paper. See § 25. ¶ 5. Vol. 2.

Cast, is to *Cast Letter*. See § 19. ¶ 1. Vol. 2.

Cast off Copy. See § 22. ¶ 9. Vol. 2.

Catch of the Bar. See § 11. ¶ 11. Vol. 2.

Chappel. See *Customs*.

Charge,

Charge, is to fill { *Paper* with great *Pages*.
 a *Page* with long and many *Lines*.
 a *Line* with many *Letters*.
 a *Pot* with *Stubs* and *Antimony*.

Chafe. See § 9. ¶ 6. Vol. 2.

Cheeks. is a part of the *Press*; for which See § 10. ¶ 2. Vol. 2. and part of the *Dressing-block-groove*. For which See § 20. ¶ 3. Vol. 2.

Choak. If a *Form* be not *Washt* in due time, the *Inck* will get into the *Hollows* of the *Face* of the *Letter*: And that getting in of the *Inck* is called *Choaking* of the *Letter*, or *Choaking* of the *Form*.

Claw of the *Sheeps-foot*. See § 11. ¶ 20. Vol. 2.

Clean Proof. When a *Proof* has but few *Faults* in it, it is called a *clean Proof*.

Close Matter. *Matter* with few *Breaks* or *Whites*.

Close Work. *ibid*.

Colation Books. See § 25. ¶ 4. Vol. 2.

Come. When the *Face* and *Shank* of a *Letter* is *Cast* perfect, *Founders* say, *It Comes well*; if unperfect they say, *It does not come*, or *It comes not well*.

Come Down. the *Toe* of the *Spindle* is said to *Come down* by *Pulling* the *Bar*: So is the *Bar* when it is *Pull'd* near the *hither Cheek*: Also, the *Press-man* is said to *Come down the Form* with his *Balls*: For which See § 24. ¶ 13. Vol. 2.

Companion. See § 24. ¶ 15. Vol. 2.

Comes off. A *Form* that receives a good *Impression*, *Comes off well*, if a bad *Impression*, it *Comes off ill*, or it *Comes not well off*. Also a phrase used in *Gathering* of *Books*; for a *Heap* that is *Gathered off* is said to *Come off*. See § 25. ¶ 3. Vol. 2.

Com-

Composing Rule. See § 24. ¶ 4. Vol. 2.

Compositer. He that *Composes* or *Sets* the *Letters*.

Composing-stick. See § 9. ¶ 4. Vol. 2.

Copy-money. See *Customs*.

Cording-quire. See § 25. ¶ 5. Vol. 2.

Correct. When the *Corrector* reads the *Proof*, or the *Compositer* mends the *Faults* he markt in the *Proof*, they are both said to *Correct*; the *Corrector* the *Proof*, the *Compositer* the *Form*.

Correcting-stone. See § 6. Vol. 2.

Corrections. the *Letters* markt in a *Proof* are call'd *Corrections*. See § 22. ¶ 8. Vol. 2.

Counter Punch. See § 13. ¶ 2. Vol. 2.

Counting off Copy. See § 22. ¶ 9. Vol. 2.

Coyus. See § 8. Vol. 2.

Cramp Irons. See § 11. ¶ 15. Vol. 2.

Cross Long, Short. See *Chase*.

Cull Paper. See § 25. ¶ 5. Vol. 2.

Cut the Frisket. See § 24. ¶ 7. Vol. 2.

D

Dance. See § 22. ¶ 7. Vol. 2.

Dele. See § 23. Vol. 2.

Destribute. See § 22. ¶ 3. Vol. 2.

Destributing-stick. See *ibid*.

Devil. The *Press-man* sometimes has a *Week-Boy* to *Take Sheets*, as they are *Printed off* the *Tympan*: These Boys do in a *Printing-House*, commonly black and *Dawb* themselves; whence the *Workmen* do *Jocosely* call them *Devils*; and sometimes *Spirits*, and sometimes *Flies*.

Direction, the word that stands alone on the *Right Hand* in the bottom *Line* of a *Page*.

D d d

Dir-

Direction-line. The Line the *Direction* stands in.

Double Letter. æ œ ſh, and several others *Cast* on one *Shank* are called *Double Letters*: ſ and f have several *Ascending Letters* joyned to them, because their *Beaks* hanging over their *Stems* would (were they not *Cast* on one *Shank*) ride upon the tops of the *Stems* of the adjoining ascending *Letter*.

Double. A Sheet that is twice *Pulled* and lifted never so little off the *Form* after it was first *Pulled*, does most commonly (through the Play of the *Joynts* of the *Tympan*) take a double *Impression*: This Sheet is said to *Double*. Or if the *Press-man* Run in so, as the Fore-side of the *Plattin* Print with the *First Pull* into part of the *Second Pull*, or the hind edge of the *Plattin* Print with his *Second Pull* into part of his *First Pull*; either of these twice *Printing* is called *Doubling*. *Doubling* also happens through the loose *Hanging* of the *Plattin*, and through too much play the *Tennants* of the *Head* may have in the *Mortesses* of the *Cheeks*, and indeed through many *Wearings* and crasienesses that often happens in several parts of the *Press*. See § 24. ¶ 18. Vol. 2.

Dress a Chase, or Dress a Form, is all one. It is to fit the *Pages* and the *Chase* with *Furniture* and *Quoins*. See § 22. ¶ 7. Vol. 2.

Dress Letter. See § 21. ¶ 1. Vol. 2.

Dressing Block. See § 20. ¶ 3. Vol. 2.

Dressing Block grows *ind*.

Dressing Hook. See § 20. ¶ 1. Vol. 2.

Dressing Knife. See § 20. ¶ 4. Vol. 2.

Dressing Sticks. See § 19. ¶ 6. Vol. 2.

Drive out. When a *Compositor* Sets *Wide*, he is said to

to Drive out or Run out. In Founding, If Letter be Cast too Thick in the Shank it Drives out, or if it be Cast too Thick in any part of the Shank, as the Head, the Foot, the sides at Head or Foot, or Body at Head or Foot : They say, It Drives out at Head, It Drives out at Foot, &c.

E

Empty Case. See § 22. ¶ 3. & See Case is Low.

Easie Pull. See § 24. ¶ 5. Vol. 2.

Easie Work. See § 22. ¶ 4. And Great Letter and a Small Form the Press-man calls Easie Work.

Empty Press. A Press that Stands by, which no Workman Works at : Most commonly every Printing-House has one of them for a Proof-Press : viz. to make Proves on.

English Body. See § 1. ¶ 2. Vol. 2.

English Face. Plate 26. 27. are English Face Letters.

Even Page. The First Page of a Sheet or Form is called an Odd Page, but the Second, Fourth, Sixth, or any other even numbred Page is called an Even Page. See § 22. ¶ 7. Vol. 2.

F

Face of a Letter, See § 13. ¶ 13. Vol. 2.

Face of a Page, or Form. The Superficies of a Page or Form, where the Faces of every Letter lies in the same Plain.

Face-Gage. See § 12. ¶ 5. Vol. 2.

Face of a Matrice. See § 17. ¶ 1. Vol. 2.

Fat Ashes. Founders call their Ashes Fat, if they are considerably Heavy, because then they have much Mettle in them.

Fat. See Beat Fat.

Fat Face, or *Fat Letter*, is a broad Stemmed Letter.

Female Gage, Screws, &c. The *Hollow Gage*, or *Hollow Screw* that receives its *Match Gage* or *Screw*, &c.

First. See § 24. ¶ 15. Vol. 2.

First Form. The *Form* the *White Paper* is Printed on, which generally by Rule ought to have the *First Page* of the Sheet in it.

First Page. See § 22. ¶ 7. Vol. 2.

First Pull. See § 11. ¶ 16. & § 24. ¶ 7. Considerations 8. & § 24. ¶ 15. Vol. 2.

Flat-Gage. See § 12. ¶ 3. Vol. 2.

Flat Table. See § 12. § 8. Vol. 2.

Fly. See *Devil*.

Follow. viz. See if it follows, is a Term used as well by the *Corrector* as by the *Compositer* and *Press-man*. It is used by the *Corrector* and *Compositer* when they examine how the beginning *Matter* of a succeeding *Page* agrees with the ending *Matter* of the precedent *Page*: And how the *Folio's* of those *Pages* properly and numerically follow and succeed one another, Lest the *Pages* should be *Transposed*. But the *Press-man* only examines that the *Folio* and beginning word of the *Second Page*, and *Signature* of the *First* and *Third Page* (when the *Reiteration* is on the *Press*) follows the *Folio* and *Direction* of the *First Page*, and the *Signature* of the *Third Page* follows the *Signature* of the *First Page*, orderly according to the *Volume*, lest the *Form* should be laid wrong on the *Press*.

Foot of the Letter. The *Break-end* of the *Shanck* of a *Letter*.

Foot-

Foot-line. See § 14. ¶ 12. Vol. 2.

Foot of a Page. The bottom or end of a *Page*. See § 22. ¶ 7.

Foot-Step. See § 11. ¶ 21. & § 24. ¶ 7. & Considerations 11. Vol. 2.

Foot-stick. See § 8. Vol. 2.

Form. The *Pages* when they are fitted into a *Chase*.

Foul Proof. When a *Proof* has many *Faults* markt in it.

Fount. Is the whole number of *Letters* that are *Cast* of the same *Body* and *Face* at one time. See § 2. ¶ 2. Vol. 2.

Frisket. See § 10.

Froze out. In Winter when the Paper is Froze, and the *Letter* Froze, so as the Workmen cannot Work. They say, They are Froze out.

Fryer. When the *Balls* do not *Take*, the *Un-taking* part of the *Balls* that touches the *Form* will be left White, or if the *Press-men* Skip over any part of the *Form*, and touch it not with the *Balls*, though they do *Take*, yet in both these cases the White places is cal'd a *Fryer*.

Full Form or Page. A *Form* or *Page* with few or no *Breaks* or *White-lines*.

Full Press. When two Men Work at the *Press*. It is called a *Full Press*.

Furnace. See § 18. Vol. 2.

Furnace open, or *Wind Furnace.* See § 18. ¶ 2. Vol. 2.

Funnel. See § 18. Vol. 2.

Furniture. See § 8. Vol. 2.

G

Gage. Gages mentioned in this Volumne have an adjunct Name, as *Flat Gage*, *Joynt Gage*, *Italick Gage*, *Long Gage*, *Male Gage*, *Short Gage*, *Standing Gage*, *Steel Gage*, which See respectively.

Galley. See § 5. Vol. 2.

Galley-Slave. See the Customs.

Gallows. See § 10. Vol. 2.

Garter. See § 11. ¶ 14. Vol. 2.

Gather Books. See § 25. ¶ 3. Vol. 2.

Geat, is the little Spout or Gutter made in the Brim of *Casting Ladles*.

Get in. Matter is *Got in* in a *Line*, *Page*, *Sheet* or *Book*, if *Letter* be Thinner Cast than the *Printed Copy* the *Compositer Sets* by. Or Matter is *Got in* if the *Compositer Sets Closer*: Or if he *Widens* his *Measure*; or puts more *Lines* in a *Page*. See a *Line*.

Girts. See § 11. ¶ 21. Vol. 2.

Good Colour. Sheets Printed neither to Black or too White.

Good of the Chappel. Forfeitures and other *Chappel Dues* are Collected for the *Good of the Chappel*, viz. to be spent as the *Chappel* approves.

Good Work, is called so in a twofold sense: The Master-Printer calls it *Good Work* when the *Compositers* and *Press-men* have done their duty; and the Work-men call it *Good Work*, if it be *Light Easie Work*, and they have a good price for it.

Go up the Form. See § 24. ¶ 13. Vol. 2.

Great Cannon. See § 2. ¶ 2. Vol. 2.

Great Numbers. See *Lay on*. Above 2000 Printed on one Sheet are accounted *Great Numbers*.

Great

Great Primmer. See § 2. ¶ 2. Vol. 2.

Gutter-stick. See § 8. Vol. 2.

H

Hag. See § 15. ¶ 1. Vol. 2.

Half a Line. When *Letter Drives out* or *Gets in* in the *Body*, in a number of *Lines*, *Founders* say, *It Drives out* or *Gets in* *Half a Line*, a whole *Line*, a quarter of a *Line*, &c. viz. *Half a Body*, a whole *Body*, a quarter, &c. of a *Body*.

Half a Press. When but one *Man Works* at the *Press*, It is called *Half a Press*.

Half Work. He that *Works* but three days in the *Week*, does but *Half Work*.

Hammer end of a Punch. See § 13. ¶ 13. Vol. 2.

Hangs. See *Letter Hangs.* & § 22. ¶ 4. Vol. 2.

Hang the Plattin. See § 24. ¶ 4. Vol. 2.

Hang up Paper. See § 25. ¶ 1. Vol. 2.

Hard Inck. *Inck* very well *Boyled.* See § 11. ¶ 23. Vol. 2.

Hard Justifying. See § 22. ¶ 4. Vol. 2.

Hard Pull. See § 24. ¶ 5. Vol. 2.

Hard Work. See § 22. ¶ 4. And small *Letter* and a Large *Form*, *Press-men* call *Hard Work*.

Head. See § 10. ¶ 5. Vol. 2.

Head Line. See § 14. ¶ 2. Vol. 2.

Head of a Page. The top or beginning of a *Page.* See § 22. ¶ 7. Vol. 2.

Head-stick. See § 8. Vol. 2.

Heap. So many *Reams* or *Quires* as is *Set out* by the *Warehouse-keeper* for the *Press-man* to *Wet*, is call'd a *Heap*: But then it is call'd a *Dry Heap*, till the *Press-man* have *Wet* it, and then it is indeed called a *Heap*. See also § 25.

Heap.

Heap holds out. When it hath its full intended Number of Sheets.

Heavy Work. See *Hard Work*.

Heighth. See *High against Paper*.

High against Paper. If a *Punch* be not Sunk deep enough into the *Matrise*, the *Letter Cast* will not stand high enough against Paper. And if it be Sunk too deep into the *Matrice*, the *Letter Cast* will be too *High* against Paper. See § 17. ¶ 2. Vol. 2.

Holds out, or Holds not out. These Terms are applicable to the *Quires* of *White-paper*, to *Wrought-off Heaps*, to *Gathered Books*, and to sorts of *Letter* &c. If *Quires* of *White Paper* have twenty five Sheets a piece in them, they say, *The Paper holds out five and twenties*. Of *Wrought off Heaps*, the *Heap* that Comes off first in *Gathering* is said, *Not to Hold out*. Of *Gathered Books*, if the intended number of perfect *Books* are *Gathered*, they say the *Impression Holds out*: But if the intended number of *Perfect Books* cannot be *Gathered* off the *Heaps*, they say the *Impression Holds not out*. And so for Sorts of *Letter*, either when it is in the *Founding House*, or in the *Printing House*.

Hole. By a *Hole*, in *Printers* dialect, is meant and understood a place where private *Printing* is used, viz. the *Printing* of *Unlicensed Books*, or *Printing* of other mens *Copies*. Many *Printers* for *Lucre* of *Gain* have gone into *Holes*, and then their chief care is to get a *Hole* Private, and *Workmen* Trusty and *Cunning* to conceal the *Hole*, and themselves.

Holy-days. See *Customs*.

Hollows of a Letter. The *Sinking in* of the *Counter*-

ter-Punch into the *Punch* makes these *Hollows*, so does *Sculping* into the *Face* of the *Punch*. See § 9. ¶ 4. Vol. 2.

Hooks. See *Hags*.

Horse. The Form or Bench *Press-men* set the *Heaps* of Paper on. See also *Customs*.

Horse-flesh. If any Journeyman set down in his Bill on *Saturday Night* more Work than he has done, that Surplusage is called *Horse-flesh*: And he abates it in his next Bill.

Hose. See § 11. ¶ 14. Vol. 2.

Hours. *Press-men* reckon their Work by Hours, accounting every *Token* to an Hours Work: And though it be the same effectually with *Tokens*, yet they make their prizes of different Work by the Hour; and it passes current for a *Token*. If two Men Work at the *Press* ten *Quires* is an Hour; if one Man, five *Quires* is an Hour.

I

Jaws. See § 15. ¶ 6. Vol. 2.

Imperfections of Books. See § 25. ¶ 3. Vol. 2.

Imperfections of Letters. When the *Founder* has not Cast a proportionable number of each sort of *Letter*, the wanting *Letters* are called *Imperfections*, as making the rest of the *Fount* imperfect. See *Sorts*.

Impose. See § 22. ¶ 7. Vol. 2.

Impression holds out. See *Holds out*.

In-Page. See *Out-Page*.

Insertion. If the *Compositer* have left out Words or *Lines*, the *Corrector* inserts it, and makes this mark ^ where it is *Left out*, which is called the mark for *Insertion*. See § 23. Vol. 2.

- Joynt flat Gage.* See § 14. ¶ 4. Vol. 2.
Joynts. See § 10. ¶ 9. Vol. 2.
Inner Tympan. See § 11. ¶ 10. Vol. 2.
Italick Gage. See § 12. ¶ 6. Vol. 2.
Justifie a Matrice. See § 17. ¶ 2. Vol. 2.
Justifie a Mold. See § 16. Vol. 2.
Justifie a Stick. viz. a *Composin'-stick.* See § 22. ¶ 4. Vol. 2.

K

Keep in, is a caution either given to, or resolved on, by the *Compositer*, when there may be doubt of *Driving out* his *Matter* beyond his *Counting off*, wherefore he *Sets close*, to *Keep in*.

Keep out, is a caution either given to or resolved on, by the *Compositer*, when there may be doubt of *Getting in* his *Matter* too fast for his *Counting off*: Wherefore he *Sets Wide*, to *Drive* or *Keep out*.

Kern. See § 19. ¶ 5. Vol. 2.

Kerning-Knife. See § 19. ¶ 5. Vol. 2.

Kerning-stick. See § 19. ¶ 5. Vol. 2.

Knife backt Sculptor, is a Sculptor with a thin edge on its back.

Knisc-file. A file with a thin edge.

Knock up Balls. See § 24. ¶ 10. Vol. 2.

Knock up Books. See § 25. ¶ 3. Vol. 2.

Knock up a Letter. It sometimes happens with old *Letter*, that a *Letter* may be worn so low that it will not Print well in a *Page*: The Workman then takes that *Letter* out of the *Form*, and holds the *Shank* of it upon the side of the *Chase*, and with the *Head* of the *Shooting-stick* beats lightly upon the *Foot* of the *Shank*, till he have battered *Mettle* enough.

enough out of the *Shank*, to raise it higher against Paper: If it prove too high against Paper, he Rubs the bottom of the *Shank* upon the side of the *Chase* to rub it down: This Operation seldom happens, unless another of the same sort of *Letter* is wanting, and hard to come by: For else the *Compositer* will bow the *Letter*, and pop it into a *Waste Box* in his *Cafe*, where he puts all naughty *Letters*, that he may not be troubled with them another time.

Knot. See § 20. ¶ 3. Vol. 2.

L

Ladles. See § 18. ¶ 3. Vol. 2.

Lay in Sheets. When the *Press-man* lays *Sheets* on the *Tympan*, it is stiled *Laying in Sheets*.

Lay out Sheets. When the *Press-man* takes *Sheets* off the *Tympan*, and lays them on the *Heap*, it is stiled *Laying out Sheets*.

Lay on. A phrase used for the Number of Books to be Printed. Thus they say, There is 1000, 2000, 3000, &c. *Laid on*. See *Great Numbers*. See *Small Numbers*.

Lean Ashes. Founders call their *Ashes Lean*, if they are *Light*; because then they have little *Mettle* in them. See *Fat Ashes*.

Lean. See *Beat Lean*.

Lean Face. A *Letter* whose *Stems* and other *Stroaks* have not their full width.

Lean Stroaks. The fine *Stroaks* in a *Letter*.

Leather Groove. See § 17. ¶ 2. Vol. 2.

Letter-Board. See § 7. Vol. 2.

Letter Hangs. If the *Compositer* has been careless in Emptying his *Composing-stick*, so as to let the *Letter*

loosely down in the *Galley*, and they stand not perfectly Square and Upright, the *Letter Hangs* : Or if after *Overrunning* on the *Correcting-stone* he has not Set his *Letter* in a Square position again, before he *Locks up*, (for we may suppose when the *Pages* are Open'd the *Letter* stands Loose, and more or less out of Square) So then, the *Matter* standing thus out of Square, is said to *Hang*. See § 22. ¶ 4, 7. Vol. 2.

Light Work. See *Easie Work*.

Liner. See § 12. ¶ 7. Vol. 2.

Lining-Stick. See § 16. ¶ 2. Vol. 2.

Lock up. See § 22. ¶ 7. and § 21. ¶ 1. Vol. 2.

Long Cross. See *Chase*.

Long Gage. See § 12. ¶ 5. Vol. 2.

Long Primmer. See § 2. ¶ 2. Vol. 2.

Long Pull. See § 24 ¶ 5. Vol. 2.

Loose Justifying. See § 22. ¶ 4. Vol. 2.

Low against Paper. See *Heighth against Paper*.

Low Case. When the *Compositer* has *Compos'd* almost all his *Letters* out of his *Case*, he says his *Case* is *Low*.

Lower Case. See § 3. Vol. 2.

M

m Thick. See § 13. ¶ 1 Vol. 2.

Make a Measure. See § 22. ¶ 4. Vol. 2.

Make ready the Form. See § 24. ¶ 7. Vol. 2.

Male Gage. The outer *Gage*, or outer *Screw*, that enters or fits into its *Match Gage* or *Screw*, &c.

Mallet. See § 9. Vol. 2.

Matrice. See § 17. ¶ 1. Vol. 2.

Matter. The series of the discourse of the *Compositer*. Copy. Mea-

Measure. The width of a *Page*. See *Composing-Stick*.

Mettle. See § 18. ¶ 2. Vol. 2.

Mold. See § 15. ¶ 1. Vol. 2.

Monk. When the *Press-man* has not *Destributed* his *Balls*, some splotches of *Inck* may lye on one or more of them, which in *Beating* he delivers upon the *Form*; so that the *Sheet Printed* on has a black blotch on it: Which Blotch is called a *Monk*.

Mouth-piece. See § 15. ¶ 1. Vol. 2.

N

n Thick. See § 13. ¶ 1. Vol. 2.

Naked Form, or Page, is when the *Furniture* is taken from about all sides of the *Form* or *Page*. See § 22. ¶ 7. Vol. 2.

Neck of a Letter. So much of the *Punch* as is Sunk into the *Matrice* is called the *Neck*; and when that *Letter* is *Cast* of *Mettle*, it is so much as comes above the *Square* of the *Shank*, viz. above the *Beard*.

Nick. See § 15. ¶ 1. Vol. 2.

Nomparel. See § 2. ¶ 2. Vol. 2.

Notch of the Matrice. See § 17. ¶ 2. Vol. 2.

Notes. *Quotations* down the side of a *Page* are called *Notes*.

Number Laid on. See *Lay on*.

Nut of the Spindle. The *Female Screw* that receives the *Worms* of the *Spindle*.

O

Odd Page. The *First*, *Third*, *Fifth*, *Seventh*, and all un-even numbred *Pages* are *Odd Pages*.

Off. A *Press-man* usually says, *I am off*, meaning he has.

has Wrought off his Token, his Heap, his Form.

Open Matter. Full of Breaks and Whites.

Open Furnance. See § 18. ¶ 2. Vol. 2.

Open the Form. See § 22. ¶ 2. Vol. 2.

Open Work. See Open Matter.

Over-run. See § 22. ¶ 8. Vol. 2.

Out. A Compositier usually says, *I am Out*, meaning he has Set out his Page, Form, or Copy. See also § 23. Vol. 2.

Out-Page. In Octavo's, Twelves, Sixteens, every Out-side Page in the Sheet is called an Out-Page, the rest are called In-pages.

Out of Register. Bad Register. See § 24. ¶ 7. Vol. 2.

P

Pale Colour. If there be not Blacking enough in the Inck, or the Form be Beaten with too Lean Balls, the Work will be said to have a Pale Colour.

Pallat. See § 15. ¶ 1. Vol. 2.

Pan. The great Ladle that Founders melt their Mettle in, when they are Casting Letters, is called the Pan. See also § 9. ¶ 18. Vol. 2.

Paper-bench. See Horse.

Paper-board. See § 7. Vol. 2.

Paper the Case. See § 22. ¶ 1. Vol. 2.

Paper Windows. See Customs.

Paper up Letter. Pages. See § 22. ¶ 10. Vol. 2.

Pearl. See § 2. ¶ 2. Vol. 2.

Peel. See § 11. ¶ 22. Vol. 2.

Pelts. Sheep Skins untan'd, used for Ball Leathers.

Pica. See § 2. ¶ 2. Vol. 2.

Picks. When either pieces of the Skin or Film that grows on Inck with standing by, or any dirt get into the

the *Hollows* of the *Face* of the *Letter*, that *Film* or *Dirt* will fill or choak up the *Face* of the *Letter*, and *Print Black*; and is called a *Pick*; because the *Press-man* with the point of a *Needle*, picks it out.

Pidgeon-holes. See § 22. ¶ 24. Vol. 2.

Plattin.

Plattin-hooks.

Plattin-pan.

Plattin-plate.

} See § 9. ¶ 18. Vol. 2.

Play with Quadrats. See *Customs*.

Plow. See § 20. ¶ 5. Vol. 2.

Points. See § 11. ¶ 19. Vol. 2. Also ,; : - ? ! ()

[* § †, and other marks, are all by *Printers* and *Founders* called *Points*:

Point-holes. The two *Holes* the *Points* prick in a *Sheet* of *Paper*. See § 22. ¶ 7. Vol. 2.

Point-Screws. See § 11. ¶ 9. Vol. 2.

Press. See § 10. Vol. 2.

Press-man. See § 24. ¶ 1. Vol. 2.

Press goes. When the *Press-men* are at *Work*, the *Press* is said to *Go*.

Press goes Hard, Heavy. See § 24. ¶ 5. and *Press goes Easie, Light*.

Press stands still. When the *Press-men* are not at *Work*, the *Press* is said to *stand still*.

Press-stone. See § 11. ¶ 17. Vol. 2.

Proof. See § 24. ¶ 18. Vol. 2.

Proof Letters. See § 16. ¶ 2. Vol. 2.

Proof Press. See *Empty Press*.

Print Hund. See *Plate* 11, 12, 13, 14, 15, 16, 17.

Pull—*Easie, Long, Short, Soft*. See § 24. ¶ 5. Vol. 2.

Punch.

Punch. See § 13. ¶ 1. Vol. 2.

Py. when a *Page* is broken, those broken *Letters* are called *Py.* See *Broken Letter.*

Quadrats. See § 19. ¶ 1. Vol. 2.

Quarters. *Quarto's*, *Octavos* and *Twelves* *Forms* are *Imposed* in *Quarters.* They are called *Quarters*, not from their equal divisions; but because they are *Imposed* and *Lockt up* apart. Thus half the *Short-Cross* in a *Twelves* *Form* is called a *Quarter*, though it be indeed but one Sixth part of the *Form.*

Quoins. See § 8. Vol. 2.

Quotation Quadrats. Are *Cast* the heighth of the *Quotation.* They are *Cast* of different *Bodies*, that the *Compositer* may have choice of them to *Justifie* his *Notes* or *Quotations* exactly against the designed *Line* of the *Page.*

R

Racks. See § 11. ¶ 22. & § 12. ¶ 19. Vol. 2.

Rag. When *Letter-Cast* has a *Bur* on any of its edges, that *Bur* is called a *Rag.*

Register. See § 15. ¶ 1. & § 24. ¶ 7. Vol. 2.

Register-sheet. The *Sheet* or *Sheets* Printed to make *Register* with.

Reteration. The *Second Form*, or the *Form* Printed on the backside of the *White Paper.*

Revise. See § 23. Vol. 2.

Ribs. See § 10. ¶ 8. & § 11. ¶ 15. Vol. 2.

Riglet. Is a sort of *Furniture* of an equal *Thicknes* all its *Length.* It is *Quadrat* high, of several *Thicknes*ses, viz. a *Nomparel*, *Brevier*, *Long-primmer*, *Pica*, &c. *Thick.*

Rince

Rince the Form. See § 22. ¶ 2. Vol. 2.

Rincing-Trough. The Trough Forms are *Rinc'd* in. *Rise.* A Form is said to *Rise*, when in Rearing it off the *Correcting-stone* no Letter or Furniture, &c. stay behind. See § 22. ¶ 7. Vol. 2.

Rounce. See § 11. ¶ 16. Vol. 2.

Rowl up the Ball Leathers. See § 24. ¶ 18. Vol. 2.

Rub Letter. See § 19. ¶ 4. Vol. 2.

Rubs not. When the Shank is Cast too Thin, that in *Rubbing* part of the Face or the Topping or Footing *Rubs* away : Founders say, *It does not Rub.*

Rubs well. When the Shank of a Letter has a proper Thickness, Founders say, *It Rubs well.*

Rub out Inck. See § 24. ¶ 11. Vol. 2.

Rules. viz. *Brass Rules.* See § 2. ¶ 2. Vol. 2.

Run in the Carriage. See § 24. ¶ 15. Vol. 2.

Runs on Sorts, when Matter runs much on some few Sorts of Letters, they say, *it Runs on Sorts,* See *Sorts.*

Run out from Copy. See *Drive out.*

S

Scaboard. See § 8. Vol. 2.

Second at the Press. See § 24. ¶ 15. Vol. 2.

Second Pull. See § 11. ¶ 16. Considerations 8. & § 24. ¶ 15. Vol. 2.

Sets False. See *foul Proof.*

Sets Clean. See *Clean Proof.*

Sets Close. See *Get in.*

Sets Wide. See *Drive out.*

Set out Paper. See § 25. ¶ 5. Vol. 2.

Set the Rounce. See § 24. ¶ 3. Vol. 2.

Sets off. Work that is newly *Wrought off* at the Press

F f f

often

often *Sets off*, especially if it be *Fat Beaten* with *Soft Inck*; For when it comes to be *Beaten*, or sometimes only hard prest by the *Book-binder*; the moist *Inck* spreads and delates it self round about the *Face* of every *Letter*, and fullies and stains the whole *White Paper*.

Shake. See § 19. ¶ 1. Vol. 2.

Shank, the square *Mettle* the *Face* of a *Letter* stands on; is called the *Shank* of a *Letter*.

Sheeps-foot. See § 11. ¶ 20. Vol. 2.

Shooting-stick. See § 9. ¶ 2. Vol. 2.

Short-cross. See *Chase*.

Short-Page. See § 12. ¶ 5. Vol. 2.

Side-stick. See § 8. Vol. 2.

Signature. See § 22. ¶ 4. Vol. 2.

Sinck Matrices. See *Sinck Punches*.

Sinck Punches. See § 17. ¶ 1. Vol. 2.

Slice. See § 11. ¶ 11. Vol. 2.

Sliding-Gage. See § 12. ¶ 4. Vol. 2.

Sliding-Socket. See § 12. ¶ 4. Vol. 2.

Small Numbers. Under 1500 *Laid on* is accounted a *Small Number*. See *Great Numbers*; and See *Lay on*.

Smoak Vent. See § 18. ¶ 1. Vol. 2.

Smout. Workmen when they are out of constant Work, do sometimes accept of a Day or twos Work, or a Weeks Work at another Printing-house: this By-work they call *Smouting*.

Soaking Pull. See § 24. ¶ 5. Vol. 2.

Soft Pull. *ibid*.

Soft Inck. *Inck* or *Varnish* moderately boiled. See § 11. ¶ 23. Vol. 2.

Solace. See *Customs*.

Sop the Balls. When a *Press-man* has taken too much *Inck*, he is said to *Sop the Balls*.

Sorts. The *Letters* that lye in every *Box* of the *Cafe* are separately called *Sorts* in *Printers* and *Founders* Language; Thus a is a *Sort*, b is a *Sort*, c is a *Sort*, &c.

Space Thick, Space Thin. See § 12. ¶ 1. Vol. 2.

Spindle. See § 11. ¶ 12. 16. Vol. 2.

Spirit. See *Devil*.

Spring. See § 15. ¶ 1. Vol. 2.

Squabble. A *Page* or *Form* is *Squabbled* when the *Letter* of one or more *Lines* are got into any of the adjacent *Lines*; or that the *Letter* or *Letters* are twisted about out of their square Position.

Stem. The strait *Flat* strokes of a straight *Letter* is called *Stem*. See § 14. ¶ 1. Vol. 2.

Stick. The *Composing-stick* commonly so called.

Stickfull. See § 22. ¶ 4. Vol. 2.

Stiff Justifying. See § 22. ¶ 4. Vol. 2.

Stirring-Pote. See § 18. ¶ 2. Vol. 2.

Stoak-hole. See § 18. ¶ 1. Vol. 2.

Stoaking-Rod. A *Rod* of thick *Wyer* put into such an *Handle* as is the *Handle* of a *Letter-Ladle*. *Founders* use it to stir up the *Fire* in the *Furnace*.

Stone. See § 19. ¶ 1. Vol. 2.

Stool. See § 15. ¶ 1. Vol. 2.

Stop. See § 19. ¶ 1. Vol. 2.

Strip a Form. See § 22. ¶ 2. Vol. 2.

Strokes, are fat, lean, fine, hair. See § 14. ¶ 2. Vol. 2.

Superiour Letters, are often set to *Marginal Notes*: They are *Letters* of a *Small Face*, high *Justified* by

the Founder in the *Mold* near the *Top-Line*.

Swash-Letters. See Plate 15.

T

Tache. A small Board with *Notches* in its Fore-edge; either nailed upon the Fore-edge of the *Work-Bench*, or screwed into the *Vice*; so as the *Notches* may stand forwards to rest the *Shank* of a *Punch* in. See § 12. ¶ 9. Vol. 2.

Tail of Letters. See a 14. ¶ 2. Vol. 2.

Take off See Customs.

Taking off. See § 22. ¶ 3. Vol. 2.

Take up. See § 22. ¶ 3. Vol. 2.

Take up a Sheet. See Customs.

Take Inck. See § 24. ¶ 10. Vol. 2.

Teze Woolh, or Hair. See § 24. ¶ 18. Vol. 2.

Thick Letter. A *Fount of Letter* that *Ruks* not high enough into the *Neck* is called *Thick Letter*; and consequently will *Drive out Matter*. See § 17. ¶ 2. Vol. 2.

Thick Space. See § 13. ¶ 1. Vol. 2.

Thin Space, ought by a strict orderly and methodical measure to be made of the Thickness of the seventh part of the *Body*; though *Founders* make them indifferently Thicker or Thinner.

Throat. See § 15. ¶ 1. & 6. Vol. 2.

Till. See § 10. ¶ 6. Vol. 2.

Toe of the Spindle. See § 11. ¶ 12. Vol. 2.

Token. See § 25. ¶ 5. Vol. 2.

Token Sheet. See § 24. ¶ 9. 15. Vol. 2.

Tongue. See § 20. ¶ 3. Vol. 2.

Tooth of the Plow. The pointed edge that Cuts the *Groove* in the bottom of the *Shanks* in the *Blocks*. See § 21. ¶ 5. Vol. 2.

Transpose.

Transpose. See § 22. ¶ 7. & § 23. Vol. 2.

Turn for a Letter. It often happens when *Matter* Runs upon *Sorts*, especially in *Capitals*, or some other *Sorts* seldom used, that the *Compositer* wants that *Sort* the *Matter* Runs on; wherefore he is loath to *Distribute Letter* for that *Sort*; or perhaps his *Case* is otherwise Full. Wherefore instead of that *Letter* or *Sort*, he *Turns* a *Letter* of the same Thickness, with the *Foot* of the *Shank* upwards, and the *Face* downwards; which *Turned Letter* being easie to be seen, he afterwards when he can accommodate himself with the right *Sort*, takes out, and puts the right *Letter* in its room. It is also a word used jocosely in the *Chappel*, when any of the *Workmen* complain of want of *Money*, or any thing else, he shall by another *Workman* be answered, *Turn for it*, viz. Make shift for it.

Tympan. See § 10. ¶ 10. Vol. 2.

Tympan-Cloath. See § 24. ¶ 18. Vol. 2.

Tympan-sheet. See § 24. ¶ 7. Vol. 2.

V

Vantage. When a *White-page* or more happens in a *Sheet*, the *Compositer* calls that *Vantage*: So does the *Press-man*, when a *Form* of one *Pull* comes to the *Press*.

Varnish. See § 11. ¶ 23. Vol. 2.

Visorum. See § 22. ¶ 4. Vol. 2.

Un-lock the Form. See § 22. ¶ 2. Vol. 2.

Underlaid. A Phrase used by *Press-men* for the *Light* and *Easie*, or *Heavy* and *Hard Running* in of the *Carriage*. Thus they say, *The Press goes light and*

F f f 3

easie

easie under Hand, or it goes *heavy* or *hard under Hand*.

Upper Hand, when the *Spindle* goes soft and easie, the *Press-men* say, *It goes well under Hand*, or *Above Hand*. But the contrary if it goes *Hard* and *Heavy*.

W

Wash the Form. See § 24. ¶ 18. Vol. 2.

Way-goose. See Customs.

Weak-Inck. See *Soft-Inck*.

Wedge. See § 20. ¶ 3. Vol. 2.

White-line. A Line of *Quadrats*.

White-Page. A Page that no *Matter* comes in.

White-Paper. Although the first *Form* be Printed off, yet *Press-men* erroneously call that *Heap White-Paper*, till the *Reteration* be Printed.

Whole-press. See *Full-Press*.

Wind-furnace. See *Open-furnace*.

Wind-hole. See § 18. ¶ 1. Vol. 2.

Wood. See § 15. ¶ 11. Vol. 2.

Wyer. See § 15. ¶ 9. Vol. 2.

FINIS.

